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VOL. I

A TO BED









THE  
**Daily Express**  
ENCYCLOPÆDIA

*INCLUDING 3500 ILLUSTRATIONS  
WITH ATLAS & GAZETTEER INDEX*



VOL. I  
A TO BED

1934  
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## PREFACE

MANY encyclopædias have been produced ranging from the single volume compendium of a comparatively small number of frequently needed facts and dates to the *Encyclopædia Britannica* with its exhaustive summary of the whole field of human knowledge written by specialists for specialists. But almost all such compilations of the greatest utility in their own field leave something to be desired from the standpoint of the average man. The information which they provide is frequently either too scanty to satisfy the legitimate expectations of the enquirer or too copious or technical to provide a ready and facile answer to his immediate question. Moreover much space is often devoted to articles under headings which have become almost traditional in encyclopædias—lengthy disquisitions on mythological characters, biographies of persons of minor historical interest whose achievements have lost their one-time importance and descriptions of insignificant villages of the Middle East or rivers of South America whose names the reader has never heard and will never hear and which play no direct part in the functioning of that vast machine which is our twentieth-century world. While our lives, the life of our nation and of all nations are rooted in the past yet to us Rome means Mussolini rather than Marius. Hardy or Masfield is a more real and living figure in our literature than Ralph Hiden or Samuel Daniel, the journeys of Shackleton or Sven Hedin rouse deeper echoes in us than those of Sir John Mandeville or Ibn Batuta and the red shirts of Moscow or the brown of Berlin engage our passions more than the contests of the Blues and Greens of imperial Byzantium.

While the compilers of the present work have sought to give due place to the great men and great deeds of the past together with all necessary data regarding their interests, their achievements and their environment they have kept in the forefront of their minds the needs of the reader of 1934 who has neither time nor patience to embark on a search through what is to him useless material for answers to his immediate problems. They have remembered that the special interests of our age are largely scientific, economic and technological and that an encyclopedia produced mainly with an eye to the needs of the literary or historical student will often disappoint the legitimate expectations of the seeker after knowledge in the modern world. Particular care has therefore been taken to see that while all necessary information on literary, artistic, philosophical and religious matters is provided, economic, scientific

and technical questions are dealt with in a fuller and more comprehensive manner than in any parallel work of similar scope.

In order that space may not be wasted by unnecessary repetition, and that subjects of wider interest may be dealt with as fully as possible, a number of fairly long and inclusive "key" articles have been inserted on such subjects as Chemistry, English History, Education, the Stock Exchange, etc., which explain the general outlines of their subjects over as wide a field as possible.

The illustrations have been selected with a view to clarifying the text so far as possible by presenting to the reader, in an easily assimilable form, facts which verbal explanations often fail concisely to convey. A number of these illustrations are reproduced by permission of the owners of the copyrights, a full list of acknowledgments in such cases will be found at the end of the final volume.

Abbreviations have been used to the smallest extent possible, and only those are employed whose meaning will be immediately obvious to the reader.

Finally, the compilers would remind the reader that the present work is no rehash or redaction of old material. Every word has been specially written for this series of volumes, and has been revised up to the latest possible day before going to press.

THE EDITOR.

# ILLUSTRATIONS

The following are the full page photogravure plates in Vol I additional to the illustrations in the text —

FRONTISPICE	<i>Facing page</i>
ABBOTSFORD ROXBURGHSHIRE (THE HOME OF SIR WALTER SCOTT)	40
THE HIGH ALTAR WESTMINSTER ABBEY	41
THE ARMADA THE PURSUIT OF THE SPANISH FLEET 1588 (FROM AN EIGHTEENTH CENTURY ENGRAVING OF THE TAPESTRIES IN THE HOUSE OF LORDS)	56
ARMOUR BACK PLATE OF GILT STEEL (ITALIAN SECOND HALF OF THE SIXTEENTH CENTURY)	57
ARUNDEL CASTLE	168
ASTRONOMY THE FULL MOON (PHOTOGRAPHED BY YERKES OBSERVATORY U S A)	169
THE BAYEUX TAPESTRY (SHOWING A PORTION OF THE DESIGN)	184
BALLET LES PRESAGES RIABOUCHINSKA VERCHININA BARONOVA LICHINE WOIZIKOWSKY	185
AMERICAN BISON AND CALF AT THE LONDON ZOO	296
BRITISH ART PINKIE BY SIR THOMAS LAWRENCE G M (THE HUNTINGTON COLLECTION U S A)	297
SPANISH ART EQUESTRIAN PORTRAIT OF THE DUCA D OLIVARES BY VELASQUEZ (IN THE PRADO MADRID)	312
ITALIAN ART MONA LISA BY LEONARDO DA VINCI (THE LOUVRE PARIS)	313
FLEMISH ART EDWARD VI AS A CHILD BY HOLBEIN (EARL OF YARBOROUGH COLLECTION)	424
ART GREEK SCULPTURE THE VICTORY OF SAMOTHRACE (THE LOUVRE PARIS)	4-5
ART ITALIAN SCULPTURE MICHELANGELO	440
ART MODERN SCULPTURE THE PRODIGAL SON BRONZE FIGURE BY RODIN	441



## PRONUNCIATION

THE imitated pronunciations are intended to assist the reader in the enunciation of unfamiliar words and necessarily especially in the case of foreign words only afford a rough approximation to the actual sound. The signs used are to be pronounced as follows —

a	as a in hat	o	as o in not
ah	a in father	o	o in note
ä	a in hate	u	u in but
är	ar in hare	u	u in tune
aw	o in more	ur	ur in lure
e	e in bell	oo	u in put
ë	e in bee	oo	oo in boon
ër	eer in deer	ou	ow in now
ê	{ e in herd or	ü	a in comma
	{ i in bird	th	th in think
i	i in bit	dh	th in there
î	i in bite	gh	ch in loch
ir	i in fire	zh	s in pleasure

Other consonants are given their ordinary English sound

## NOTES ON ORTHOGRAPHY

Although the greatest care has been taken to secure uniformity wherever possible a certain number of cases of variation in the spelling of geographical names will undoubtedly be found in these volumes.

The World War with the widespread territorial changes which arose as its consequence introduced many new names to the map of Europe and a large number of towns particularly in Central Europe which have changed their national allegiance are equally well known by their old and their new names—e.g. Gorz now officially called by its Italian name Gorizia or Akkerman which its present Rumanian rulers call Cetatea Alba. In such cases the alternative names are given in the articles referring to the places in question and cross-references are supplied from the disused name. Where any difficulty is found in consulting the Atlas volume of the Encyclopedia reference should be made to the main article on the place in question where its alternative name or names will be found and it should be sought in the atlas under these headings.





## Aa

**Aa** [AH] name given to a number of minor rivers in widely different parts of Europe. There are five bearing this name in Germany and three in Flanders. France (Pas-de-Calais) and Russia have one each.

**Aachen** [AH -GHEH] (*Aix-la-Chapelle*) city in Rhenish Prussia, near the Belgian frontier, centre of an important iron and coal mining district; there are hardware and textile manufactures and sulphur baths. Aachen in the 9th cent. was the capital of the Carolingian Empire. Charlemagne's tomb is in the cathedral (see ARCHITECTURE) in which also is the coronation chair used from 800 to 1531. Pop. 156 000. See also AIX LA-CHAPELLE CONFERENCE OF.

**Aaland Islands**, see ÅLAND ISLANDS

**Aalborg** [AHL BORG] Danish seaport on Lim Fjord, an inlet on N.E. coast of Jutland; there is a cathedral and an export trade in dairy produce and cattle. Pop. c. 43 000.

**Aalesund** [AH LE-SUND] seaport on the W. coast of Norway, about 150 m. N. of Bergen; fishing centre for cod and herring. Pop. 18 000.

**Aalst**, see Alost

**Aar** [AHR] river rising in the glaciers of the Bernese Oberland, near the Grimsel Pass and flowing through Lakes Brienz and Thun past Berne, thereafter following a sinuous course N. across the Swiss plain until it joins the Rhine near Waldshut. It is the longest Swiss river (180 m.).

**Aard vark** [AHRD VAHRK] the African ant bear was formerly referred to the order *Edentata* but is now classed as the sole representative of a special order of mammals, the *Tubulidentata*, because the teeth are traversed by an elaborate system of tubes. This creature presents a strange appearance, owing to its very long ears and pig-like

## A

## Aargau

snout ending in a disc bearing the nostrils. In build it somewhat resembles a pig, having a stout body, arched back and short thick limbs which carry strong blunt claws. The tail is thick at the base and tapering. The aard-ark attains a length of about 6 ft. and is sandy in colour, the skin



Aard vark

showing through the scanty hair. Nocturnal, timid and living in burrows it is seldom seen. It feeds on ants and termites. After breaking into an ant hill with its strong claws it licks up the ants on its extensible tongue. Several different kinds are found in tropical and southern Africa, all very similar in appearance and habits. In South Africa the Aard vark is known as the Cape Ant-eater.

**Aard wolf** [AHRD WOOLF] a S. African carnivorous mammal superficially resembling a small striped hyena but distinguished by having five toes on the fore foot, feeble jaws and small teeth. It sometimes attacks lambs but is on the whole harmless, living in burrows and feeding on carrion and on white ants which it digs out by means of its sharp claws.

**Aargau** [AHR -GOU] canton in the N. of Switzerland, an agricultural district producing wine, fruit and cattle. There are some salt mines. Capital *Basel*. The district is histori-

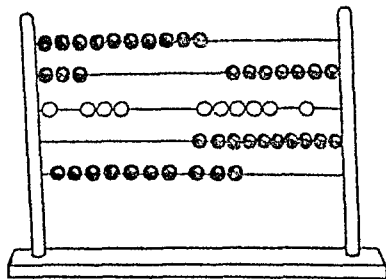
*the old*

cally interesting as one of the early seats of the Habsburg power Area 548 sq m, pop 211,000

**Arhus** [AHR'-hōōs], port in E Denmark on the peninsula of Jutland, with a good harbour, there is a trade in tobacco, silk, and cotton, and it has important distilleries Pop 76,000

**Aaron**, Jewish high-priest, brother of Moses, with whom he led the Israelites out of Egypt He was the first of a hereditary line of Israelite high-priests

**Abacus** [AB'-ū-kūs], apparatus for making arithmetical calculations The use of the abacus in some form everywhere preceded reckoning by



Abacus

written figures It is still largely employed in Russia and China, where elaborate calculations are made very rapidly with its aid It is well known in the form of the toy consisting of stretched parallel wires upon which beads can be slid, and is found universally in forms very similar to this

**Abadan**, island in the Persian Gulf, near the delta of the Shatt-el-Arab, below Mohammerah There is an important oil refinery belonging to the Anglo-Persian Oil Company A town is rapidly growing up on the island Pop c 30,000

**Abandonment**, law term used in a variety of connections, *e g* in marine insurance, to abandon the wreck of a ship, to abandon a claim or an interest in something, to give up a domicile, etc

**Abased**, or *Abaissé*, heraldic term used when a charge is placed below its usual position on the coat of arms, when placed above it is *enhanced*

**Abatement** (*O 1 r* "to beat down"), term used especially in law

(1) *Of Nuisance* the cessation of NUISANCE (q1)

(2) *Of Debts and Legacies*: a proportional reduction of claims when the assets of a deceased person are insufficient to meet the claims of creditors or legatees.

(3) *Plea in Abatement*, statement by a defendant that the action is bad because of some technical flaw See PLEADING

(4) *In Heraldry* a mark of dishonour on a coat of arms

**Abattoir** [AB-ūt-wai], establishment for the slaughter and subsequent handling of animals used for human food The abuses everywhere found connected with the slaughtering of animals on a small scale have led to the establishment by municipalities of public abattoirs, though in this respect Great Britain is much behind many other countries The most important advantage of the system is the fact that meat can by it be thoroughly inspected for diseases

**Abbas I** (1557-1628), Shah of Persia, 1585, received an embassy from European princes suggesting combination against Turkish danger, 1598-9, defeated the Turks, 1605, 1618, increased the area of Persian influence, and fixed the capital of the kingdom at Ispahan

**Abbas I** (1813-1854), Viceroy of Egypt, fought in the Syrian War (1840-41), became Viceroy in 1848, and was murdered in 1854 He ruled badly, but fostered the construction of the Alexandria-Cairo railway, 1851

**Abbas II** (1874-1923), the last Viceroy of Egypt, enthroned in 1892 He sided with Turkey in the World War of 1914, and was consequently deposed in that year

**Abbe, Ernst** (1840-1905), German physicist, became instructor in meteorology at Jena Was partner in, and

in 1848 sole proprietor of the Zeiss optical works and improved their production greatly. Invented the Albrecht refractometer (1848).

**Abbess**, the Superior of a community of nuns. The position was instituted c. 550 in the time of Pope Gregory the Great. The powers of an abbess though great, do not include the semi-episcopal functions which may be exercised by an abbot.

**Abbeville**, French town and railway junction in Département Pas-de-Calais on the R. Somme. The Gothic church has a fine façade. Textiles (woollens and linens) packing and sugar are produced. It was a British base in the World War. Pop. 90,000.

**Abbey** a convent under the rule of an abbot or abbess distinguished from a priory which is a convent under the rule of a prior or prioress. A monastery is a convent for monks (rarely for nuns); a nunnery is a convent for nuns. A convent is a community of monks or nuns living under the rule of a superior. The common connotation restricting the word to a community of nuns only is technically incorrect. A friary is a convent of friars (see below).

Abbeys were built in accordance with the requirements of the various Orders. In most cases they were self-contained units or towns in miniature each surrounded by its own wall. As a general rule, subject to slight local variations due to topographical requirements the plan of each Order was followed in all the abbeys belonging to it. In a Benedictine Abbey the church as the centre of the community occupied the centre of the walled quadrangle. Adjoining on the S were cloisters, refectory, chapter house, scriptorium, dormitory, kitchen and offices. To the N and E were the school, the infirmary, the novices' quarters and the cemetery. On the W side of the church were the various guest houses graded according to the status of the visitors. Fringing the court on the S and W was the lay department including the workshops,

mills, farm buildings, lak house, brewery and servants' quarters. A famous French Benedictine Abbey was Fontevault (1099). British examples (mainly ruined) are Bardsey (71-), Bath (1490), Battle (1067), Canterbury (600), Clastonbury (94), Gloucester (681), Malmesbury (634), Milton (823-40), Iwerstone (683), Ramsey (967), St Albans (93), Sherborne (978), Selby (1069 restored 190), Shrewsbury (1083), Tewkesbury (c. 10), Thorney (970), Westminster (Confessor's Church 1050) and Whitby. Modern Benedictine Abbeys are Ampleforth Downside (1814), Fort Augustus (established 1861) and Buckfast built by the monks (1913).

The Cluniac Order takes its name from Cluny France where a reformed Benedictine Abbey was founded in 909 (first abbot Berno and Odo). English examples are Bournemouth (1090), Much Wenlock (880) and Castle Acre (Priory 1019). Another reformed Benedictine order the Cistercian was founded at Clairvaux France in 1098. This Order was made famous by St Bernard's foundation of Clairvaux in 1151. Its abbeys characterised by great simplicity were usually erected in lonely parts of the country close to a river. They also were walled the walls being additionally protected by the diverted waters of the river. The enclosure is divided by a central wall running N and S into monastic and lay quarters. The fish ponds were outside the walls. Some of the most famous ruined abbeys in Britain are Cistercian as for example Fountains (1130), Tintern (founded 1127 as Benedictine Cistercian 1148), Kirkstall (1150), Melrose (1136) and Tintern (1131). Others are Basingwerk Flints (1131), Beaulieu (1105), Ford (1136), Medmenham (1104), Netley (1239) and Valle Crucis (1100).

The houses of the Austin or Augustinian Canons (Black Canons) include St Botolph's Priory Colchester (c. 1090), Bolton Abbey Yorks (1151), Bristol (1142) abbey church now the cathedral, Carlisle (110), Cirencester

(1117), Dorchester, Oxon (1140), Holyrood (1128), Kenilworth (1122), Lacock, Wilts (1232), Leicester (1141), Lilleshall (1148-51), Llanthony Priory, Osney (1129), and Waltham (1177) The buildings present no strikingly distinctive characteristics, except that the naves of their churches were made long, to accommodate large congregations

The Premonstratensians were founded at Prémontré, France, in 1119, British examples of their houses are Bayham (13th cent.), Easby (1152), Dryburgh (1150), and Torre (1196)

The Carthusian Order, established by St Bruno in 1084 at Chartreux, France (whence the corruption Charterhouse), demanded a novel plan for its monasteries in conformity with the asceticism of the founder, each monk occupying a solitary cell surrounded by a walled garden The cells lined the N, E, and S sides of the enclosure, whose centre was occupied by the church and cloisters The lay quarters were on the W

Famous Charterhouses include Clermont, in France, the Certosa di Pavia, in Italy, the London Charterhouse (1371), Hinton (1232), and Sheen (1414) in England The head of a Charterhouse was always a prior

The Mendicant Friars, including the Dominicans (Black Friars), Franciscans (Grey Friars), Carmelites (White Friars), and Austin Friars, date from the 13th cent As they worked among the poor their monastic buildings were placed in the centre of large towns, where careful planning was but rarely possible Their churches, without choir transepts, were divided into two approximately equal parts—for the friars and for the congregation respectively

**Abbey, Edwin Austin** (1852-1911), American painter and illustrator Painted Edward VII's coronation picture, and has much other well-known work to his credit A R A 1896, R A 1898

**Abbey Theatre**, Dublin, was re-constituted in 1904 by Miss Horni-

man as a repertory theatre, and is famous for the productions of the Irish National Players, including the plays of J M Synge, W B Yeats, and Lady Gregory

**Abbot**, the Superior of a community of monks The abbot is an important ecclesiastical dignitary with many privileges, some of which are generally confined to bishops In the Middle Ages he was an important landholder and sometimes of influence politically

**Abbot, George** (1562-1633), English divine, became Archbishop of Canterbury in 1611 His Calvinist opinions made him an enemy of Laud, and he lost his authority in 1627 for opposing the King's wishes

**Abbotsford**, Sir Walter Scott's "baronial" home, built by him on the R Tweed ( Roxburghshire) It contains many curious relics collected by him

**Abbots Langley**, village and parish in Hertfordshire, England, reputed to have been the birthplace of Nicholas Breakspear, afterwards Pope Adrian IV (*qv*), the only Englishman who has, so far, occupied the chair of St Peter

**Abbott, Edwin Abbott** (1838-1926), Headmaster of City of London School, 1865-89, author of many theological and educational works, including a *Shakespearean Grammar*

**Abbottabad**, an important military cantonment in the Hazara district on N W Frontier of India, W of Kashmir It is the headquarters of a Gurkha brigade Pop 9,000

**Abbreviations**. The shortening of words and phrases is universally employed as a time- and space-saver in writing and printing The practice was especially common in manuscripts written before the invention of printing, and it is, in general, a step in the direction of shorthand, of most systems of which it is a fundamental principle A selection of the less self-explanatory and more useful abbreviations is given below (for the abbreviations used in chemistry for the elements, *see* article **ELEMENTS**).

## Abbreviations

17

## Abbreviations

@	at (commercial)
A 1	first-class at Lloyds (shipping) first rate (colloquial)
A A	Automobile Association
A B	able bodied seaman
Abp	Archbishop
a/c	account
A C A	Associated Chartered Accountant
A C I S	Associate of the Chartered Institute of Secretaries
A D	<i>anno Domini</i> in the year of our Lord
A D C	<i>aide-de camp</i>
ad lib	<i>ad libitum</i> at pleasure
A F C	Army Educational Corps
at or <i>etatis</i>	<i>ann etatis sue</i> in the year of his age
A H	<i>anno Hegire</i> in the year of the Hegira
Ala	Alabama
Alas	Alaska
Alba	Alberta
a.m.	<i>ante meridiem</i> before noon
A M D G	<i>ad maiorem Dei gloriam</i> to the greater glory of God
A N I C E	Associate Member Institute of Civil Engineers
A M S	Army Medical Service
anon	anonymous
ant	antonym
A O C	Army Ordnance Corps
A R A	Associate of the Royal Academy
A R A M	Associate of the Royal Academy of Music
A R C M	Associate of the Royal College of Music
A R C O	Associate of the Royal College of Organists
A R C S	Associate of the Royal College of Science
Ari s	Arizona
A R I B A	Associate of the Royal Institute of British Architects
Ark	Arkansas
at wt.	atomic weight
A I C	<i>ab initio condita</i> since the founding of the city (Rome)

A V	Authorized Version (of the Bible)
B A	<i>Baccalaureus</i> (Bachelor of Arts)
B Arch	Bachelor of Architecture
B B C	British Broadcasting Corporation
B C	before Christ British Columbia
B Ch (or Ch B)	Bachelor of Surgery ( <i>Chirurgia</i> )
B C L	Bachelor of Civil Law
B Com	Bachelor of Commerce
B D	Bachelor of Divinity
B D S (or B Ch D)	Bachelor of Dental Surgery
b e	bill of exchange
B Ed	Bachelor of Education
B Eng	Bachelor of Engineering
B/I	bill of lading
B Litt	Bachelor of Literature
B M A	British Medical Association
B N C	Brasenose College Oxford
Bp	Bishop
B Phil	Bachelor of Philosophy
B Sc	Bachelor of Science
B S T	British Summer Time
B V M	<i>Beata Virgo Maria</i> Blessed Virgin Mary
C	Conservative centigrade
c	<i>circa</i> (about approximate ly)
C A	Chartered Accountant
Cal	California
Cantab	Cambridge
Cantuar	<i>Canonicus</i> (signature of Abp of Canterbury)
cap	(chapter) number of Act of Parliament
caps	capital letters (typography)
C B	Companion of the Bath
C B I	Commander of the Order of the British Empire
C C	Common or County Council
C E	Civil Engineer
Cent	Centigrade
C I	Chaplain to the Forces
cf	<i>conferatur</i> compare

## Abbreviations

18

## Abbreviations

C G M	Conspicuous Gallantry Medal	d d	days after date (of bills of exchange).
C G S	centimetre-gramme-second	Del	Delaware
CH	Companion of Honour	D F C	Distinguished Flying Cross
Chi	Chicago	D G	<i>Dei gratia</i> , "by the grace of God"
CI	Imperial Order of the Crown of India	D Litt	Doctor of Literature
C I D	Criminal Investigation Department	D N B	<i>Dictionary of National Biography</i>
C I E	Companion of the Order of the Indian Empire	do	<i>ditto</i> (the same)
c i f	cost insurance, and freight (charges included in price quoted)	D O M	<i>Deo optimo maximo</i> , "To God the best and greatest"
C-in-C	Commander-in-Chief	D O R A	Defence of the Realm Act
C M	<i>Chirurgia Magister</i> (Master of Surgery)	D P H	Diploma in Public Health
cm	centimetre	Dr	debtor, doctor
C M G	Companion of the Order of St Michael and St George	d s	days after sight (of bills of exchange)
C M S	Church Missionary Society	D S C	Distinguished Service Cross
C O D	Cash on delivery	D Sc	Doctor of Science
Colo	Colorado	D S M	Distinguished Service Medal
con	<i>contra</i> (against)	D S O	Distinguished Service Order
Conn	Connecticut	D V	<i>Deo Volente</i> , "God willing"
Consols	Consolidated Annuities (Government stock)	dwt.	pennyweight
C O S	Charity Organisation Society	E & O E	errors and omissions excepted
cp	compare	Ebor	<i>Eboracensis</i> (signature of Abp of York)
C P R	Canadian Pacific Railway	E C.	East Central District.
Cr	credit, creditor	Eccles	Ecclesiastes
C S C	Conspicuous Service Cross	Eccles	Ecclesiasticus
CSI	Companion of the Order of the Star of India	E C U	English Church Union.
C T C	Cyclists Touring Club	Ecu.	Ecuador
C V O	Commander of the Royal Victorian Order.	E E	errors excepted, Early English
cwt	hundredweight	E E T S	Early English Text Society
d	<i>denarius</i> , penny	e g	<i>exempli gratia</i> , "for example"
Dak	Dakota	E I	East India
D B E	Dame of the Order of the British Empire	E M F	electro-motive force
D C	District of Columbia	E R	East Riding (of Yorkshire)
D C L	Doctor of Civil (or Canon) Law	et al	<i>et alibi</i> , "and elsewhere"
D C M	Distinguished Conduct Medal	et cetera	<i>et cetera</i> , "and the rest"
D D	<i>Divinitatis Doctor</i> (Doctor of Divinity)	et seq	<i>et sequentia</i> , "and the following"
		exor (s)	executor(s).
		F, Fahr	Fahrenheit.

FAI	Fellow of Auctioneers In stitute	GCMG	Knight Grand Cross of the Order of St Michael and St George
FCA	Fellow of Institute of Chartered Accountants	GCSI	Knight Grand Commander of the Star of India
fcg	foolscap	GCV O	Knight Grand Cross of the Royal Victorian Order
fec	<i>fecit</i> he did it	GHQ	General Headquarters
FGS	Fellow of the Geological Society	GMB	Great Master of the Order of the Bath
PH	Fire hydrant	GMI E	Grand Master of the Order of the Indian Empire
FI	Falkland Islands	GMLP	Grand Master of the Knights of St Patrick
<i>fid def</i>	<i>fides defensor</i> Defender of the Faith.	GMMG	Grand Master of the Order of St Michael and St George
<i>fl or flor</i>	<i>floruit</i> he flourished	GMP	Grand Master of the Order of St Patrick
Fla	Florida	GMT	Greenwich Mean Time
FMS	Federated Malay States	GOC	General Officer Command ing
fob	free on board (shipping)	GPO	General Post Office
FRAM	Fellow of the Royal Acad emy of Music	GR	<i>Georgius Rex</i> (King George)
FRAS	Fellow of the Royal Astro nomical Society	Gr	grade
FRCV	Fellow of the Royal College of Music	GRCM	Graduate of the Royal College of Music
FRCO	Fellow of the Royal College of Organists	GSO	General Staff Officer
FRCP	Fellow of the Royal College of Physicians	GW R	Great Western Railway
FRCS	Fellow of the Royal College of Surgeons	HAC	Honourable Artillery Com pany
FRCVS	Fellow of the Royal College of Veterinary Surgeons	HBM	His Britannic Majesty
FRGS	Fellow of the Royal Geo graphical Society	HE	His Excellency
FRHS	Fellow of the Royal Horti cultural Society	HGDH	His (Her) Grand Ducal Highness
FRIDA	Fellow of the Royal Insti tute of British Archi tects	HH	His (Her) Highness
FRSA	Fellow of the Royal So ciety of Arts	HHH	His (Her) Imperial High ness
FSA	Fellow of the Society of Antiquaries	HLM	His (Her) Imperial Ma jesty
FSI	Fellow of the Surveyors Institute	HJS	<i>Hic jacet sepultus</i> Here lies buried
FZS	Fellow of the Zoological Society	HL	House of Keys Isle of Man
Ga	Georgia	HLI	Highland Light Infantry
GBE	Knight (or Dame) Grand Cross of British Empire	HM	His (Her) Majesty
GCB	Knight Grand Cross of the Order of the Bath.	HMS	His Majesty's Ship
GCI	Grand Commander of the Order of the Indian Empire	hp	horse-power
		HRH	His (Her) Royal Highness
		HS	His (Her) Serene Highness
		Ia.	Iowa.



## Abbreviations

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CI	Imperial Order of the Crown of India	D Litt	Doctor of Literature.
CID	Criminal Investigation Department	D N B	<i>Dictionary of National Biography</i>
CIE	Companion of the Order of the Indian Empire	do	<i>dillo</i> (the same)
c i f	cost, insurance, and freight (charges included in price quoted)	D O M	<i>Deo optimo maximo</i> , "To God the best and greatest"
C-in-C	Commander-in-Chief	D O R A	Defence of the Realm Act
CM	<i>Chirurgiæ Magister</i> (Master of Surgery)	D P H	Diploma in Public Health
cm	centimetre	Dr	debtor, doctor
CMG	Companion of the Order of St Michael and St George	d s	days after sight (of bills of exchange)
CMS	Church Missionary Society	D S C	Distinguished Service Cross
COD	Cash on delivery	D Sc	Doctor of Science
Colo	Colorado	D S M	Distinguished Service Medal
con	<i>contra</i> (against)	D S O	Distinguished Service Order
Conn	Connecticut	D V	<i>Deo Volente</i> , "God willing"
Consols	Consolidated Annuities (Government stock)	dwt	pennyweight
COS	Charity Organisation Society.	E & O E	errors and omissions excepted
cp	compare	Ebor	<i>Eboracensis</i> (signature of Abp of York)
CPR	Canadian Pacific Railway credit, creditor	EC	East Central District
CSC	Conspicuous Service Cross	Eccles	Ecclesiastes,
CSI	Companion of the Order of the Star of India	Eccius	Ecclesiasticus
CTC	Cyclists Touring Club	ECU	English Church Union
CVO	Commander of the Royal Victorian Order	Ecu	Ecuador
cwt	hundredweight	EE	errors excepted, Earl
d	<i>denarius</i> , penny	E E T S	Early English Text Society
Dak	Dakota	eg	<i>exempli gratia</i> , "for example"
DBE	Dame of the Order of the British Empire	FI	East India
DC	District of Columbia	EMF	electro-motive force
DCL	Doctor of Civil (or Canon) Law	ER	East Riding (of Yorkshire)
DCM	Distinguished Conduct Medal	et al	<i>et alibi</i> , "and elsewhere"
DD	<i>Divinitatis Doctor</i> (Doctor of Divinity).	etc.	<i>et cetera</i> , "and the rest"
		et seq	<i>et sequentia</i> , "and the following"
		exor (s)	executor(s)
		F, Fahr	Fahrenheit.

## Abbreviations

## Abbreviations

F A I	Fellow of Auctioneers Institute	G C M G	Knight Grand Cross of the Order of St Michael and St George
F C A	Fellow of Institute of Chartered Accountants	G C S I	Knight Grand Commander of the Star of India
fcp	fool cap	G C V O	Knight Grand Cross of the Royal Victorian Order
fec	<i>fecit</i> he did it	G H Q	General Headquarters
F G S	Fellow of the Geological Society	G M B	Great Master of the Order of the Bath
F H	Fire hydrant.	G M I E	Grand Master of the Order of the Indian Empire
F I	Falkland Islands	G M K I	Grand Master of the Knights of St Patrick
<i>fid def</i>	<i>fides defensor</i> Defender of the Faith	G M M C	Grand Master of the Order of St Michael and St George
<i>fl or flor</i>	<i>floruit</i> he flourished	G M P	Grand Master of the Order of St Patrick
Fla	Florida	G M T	Greenwich Mean Time
F M S	Federated Malay States	G O C	General Officer Commanding
fob	free on board (shipping)	G P O	General Post Office
F R A M	Fellow of the Royal Academy of Music	G R	<i>Georgis Rex</i> (King George)
F R A S	Fellow of the Royal Astronomical Society	Gr	grade
F R C M	Fellow of the Royal College of Music	G R C M	Graduate of the Royal College of Music
F R C O	Fellow of the Royal College of Organists	C S O	General Staff Officer
F R C P	Fellow of the Royal College of Physicians	G W R	Great Western Railway
F R C S	Fellow of the Royal College of Surgeons	H A C	Honourable Artillery Company
F R C V S	Fellow of the Royal College of Veterinary Surgeons	H B M	His Britannic Majesty
F R G S	Fellow of the Royal Geographical Society	H E	His Excellency
F R H S	Fellow of the Royal Horticultural Society	H G D H	His (Her) Grand Ducal Highness
F R I E A	Fellow of the Royal Institute of British Architects	H H	His (Her) Highness
F R S A	Fellow of the Royal Society of Arts	H I H	His (Her) Imperial Highness
F S A	Fellow of the Society of Antiquaries	H I M	His (Her) Imperial Majesty
F S I	Fellow of the Surveyors Institute	H I S	<i>Hic jacet sepulchrum</i> Here lies buried
F Z S	Fellow of the Zoological Society	H L	House of Lords Isle of Man
Ga	Georgia	H L I	Highland Light Infantry
G B E	Knight (or Dame) Grand Cross of British Empire	H M	His (Her) Majesty
G C B	Knight Grand Cross of the Order of the Bath.	H M S	His Majesty's Ship
G C I E	Grand Commander of the Order of the Indian Empire	h p	horse power
		H R H	His (Her) Royal Highness
		H S H	His (Her) Serene Highness.
		Ia.	Iowa.

## Abbreviations

20

## Abbreviations

IA	Indian Army.	KCMG	Knight Commander of the Order of St Michael and St George
IA RO	Indian Army Reserve of Officers	KCSI	Knight Commander of the Star of India
ib or ibid	<i>ibidem</i> , "in the same place"	KCV O	Knight Commander of the Royal Victorian Order.
ICS	Indian Civil Service	KC	Knight of the Order of the Garter
Id	Idaho	kg	kilogramme
id	<i>idem</i> "the same"	KGC B	Knight Grand Cross of the Order of the Bath
IDB	illicit diamond buyer (or buying)	KHC	King's Honorary Chaplain
ie	<i>id est</i> , "that is"	KHP	King's Honorary Physician
IFS	Irish Free State	KHS	King's Honorary Surgeon
IHS	<i>Iesus Hominum Salvator</i> , "Jesus, Saviour of Men", originally the Latinised form of the first three letters of the Greek name <i>IESOUS</i> (Jesus)	KKK	Ku-Klux-Klan
		KLH	Knight of the Legion of Honour
Ill	Illinois	KM	Knight of Malta
ILP	Independent Labour Party	km	kilometre
IM	Isle of Man	KOSB	King's Own Scottish Borders
IMS	Indian Medical Service	KP	Knight of the Order of St Patrick
Inc	Incorporated (of Societies, etc)	KSI	Knight of the Order of the Star of India
incog	<i>incognito</i> (unknown)	KT	Knight of the Order of the Thistle, Knight Templar.
Ind.	Indiana	Kt	Knight Bachelor
in loc	<i>in loco</i> , "in its place"	kw	kilowatt
INRI	<i>Iesus Nazarenus Rex Iudæorum</i> , "Jesus of Nazareth, King of the Jews"	Ky	Kentucky
inst	instant (current month)	L	Liberal
IOW	Isle of Wight	La	Louisiana
IRA	Irish Republican Army	Lab	Labour, Labrador
ISO	Imperial Service Order	Lat	latitude
J	Judge	lb	<i>libra</i> (pound weight).
JP	Justice of the Peace	lbw	leg before wicket
jr or jun	junior	lc	lower case ( <i>ie</i> not capitals, in typography)
Jun	June	LCC	London County Council
Jy	July	LCJ	Lord Chief Justice
Kan	Kansas	LCP	Licentiate of the College of Preceptors
KB	King's Bench; Knight Bachelor, Knight of the Bath	LDS	Licentiate in Dental Surgery
KBE	Knight Commander of the British Empire	LI	Long Island
KC	King's Counsel	lib	library
KCB	Knight Commander of the Order of the Bath	Lit Hum	<i>Literæ Humaniores</i> ("Greats"—final honours school of classics and philosophy at Oxford University)
KCIE	Knight Commander of the Order of the Indian Empire		

## Abbreviations

## Abbreviations

L.J.	Lord Justice
LL.B.	Bachelor of Laws
LL.D.	Legum Doctor (Doctor of Laws)
LL.M.	Master of Laws
L.M.S.	London Midland and Scottish Railway
L.N.E.R.	London and North Eastern Railway
long	longitude
L.P.T.B. or L.T.	London Passenger Transport Board
L.R.C.P.	Licentiate of the Royal College of Physicians
L.S.	<i>Loco sigilli</i> place of the seal
L.S.A.	Licentiate of the Society of Apothecaries
L.S.D.	<i>libras solidi denarii</i> pounds shillings pence
Ltd	Limited (Liability)
LXX	Septuagint Version (of the Old Testament)
M	Monsieur
M.A.	<i>Magister Artium</i> Master of Arts
Maj	Major
Man	Manitoba
Mass	Massachusetts
M.B.	Bachelor of Medicine
M.B.E.	Member of the Order of the British Empire
M.C.	Member of Council Master of the Ceremonies Military Cross
M.C.C.	Marylebone Cricket Club
M.Ch.	Master of Surgery
M.Ch.D.	Master of Dental Surgery
M.C.S.	Malayan Civil Service
M.D.	<i>Medicus Doctor</i> Doctor of Medicine
Md.	Maryland
M.E.	Middle English
Me	Maine
M.F.H.	Master of Foxhounds
Mgr	Monsignore (R.C. Church title of honour)
Mich.	Michigan
Mil	Military
Minn.	Minnesota
Min	Minister Plenipotentiary
Plenip	

Miss	Mississippi
Mme	Madame
Mo	Missouri
M.O.H.	Medical Officer of Health
Mon	Montana
M.P.	Member of Parliament.
m.p.h.	miles per hour
MS	manuscript
MSS	manuscripts
Mus Bac	Bachelor of Music.
Mus Doc	Doctor of Music
M.V.	motor vessel
M.V.O.	Member of the Royal Victorian Order
M.W.B.	Metropolitan Water Board
N	North
Nat	Nationalist
Nav	naval
N.B.	New Brunswick North Britain <i>no a bene</i> note well
N.C.	North Carolina
N.C.O.	non-commissioned officer
n.d.	no date
N.Dak	North Dakota
N.E.	New England North-east
Neb(r)	Nebraska
<i>nem con</i>	<i>nemini eo tradente</i> no one opposing
Nev	Nevada
N.H.	New Hampshire
N.I.	Northern Ireland
N.J.	New Jersey
N.L.	National Liberal
N.Mex	New Mexico
N.O.	New Orleans
No	<i>numero</i> number
<i>non seq</i>	<i>non sequitur</i> it does not follow
N.P.	New Providence
n.p.	new paragraph
N.R.	North Riding (of Yorkshire)
N.S.	New Style (calendar)
	Nova Scotia
N.S.W.	New South Wales
N.T.	New Testament
N.U.R.	National Union of Railwaymen
N.Y.	New York (City or State)
N.Z.	New Zealand
O	Ohio
<i>ob</i> or <i>obit</i>	<i>obit</i> died "

O B E	Officer of Order of British Empire	Q E D	<i>quod erat demonstrandum</i> , "which was to be demonstrated"
O E.	Old English	Q E F	<i>quod erat faciendum</i> , which was to be done
O E D	Oxford English Dictionary	Q M G	Quart. Master-General
O. H. M. S.	On His Majesty's Service	Qmr	quartermaster
O K	"all correct"	qq v	<i>quæ vide</i> , "which see" (plural)
Okla	Oklahoma	Q S	Quarter Sessions
O M	Member of the Order of Merit	qto	quarto
Ont	Ontario.	Que	Quebec
O. P.	opposite prompt (side of theatre), out of print (of books).	q v	<i>quod vide</i> , "which see."
Ore(g)	Oregon	Qy	Query
OS	Old Style (calendar)		
OT	Old Testament		
OTC	Officers' Training Corps		
O U D S	Oxford University Dramatic Society	R A	right ascension (astronomy), Royal Academician, Royal Artillery
Oxon	Oxford	R A C	Royal Automobile Club
oz	ounce	R A F	Royal Air Force
Pa	Pennsylvania	R A M	Royal Academy of Music.
P. & O.	Peninsular and Oriental (Steam Navigation Company)	R A M C	Royal Army Medical Corps.
P C	Privy Council (-lor), police-constable	R A N	Royal Australian Navy.
Ph C	Pharmaceutical Chemist	R A O C	Royal Army Ordnance Corps
Ph D	Doctor of Philosophy	R A S C	Royal Army Service Corps
Phil(a)	Philadelphia	R A V C	Royal Army Veterinary Corps
P L A	Port of London Authority	R B. A.	Royal Society of British Artists
p m	<i>post meridiem</i> , "afternoon"	R C	Roman Catholic, right centre (of theatre stage).
PMG	Postmaster-General	R C M	Royal College of Music
P M O	Principal Medical Officer	R D	Naval Reserve Decoration, rural dean
P P.	<i>per procuracionem</i> , "by procurator."	R D C	Rural District Council.
P P C	<i>pour prendre congé</i> , "to take leave"	R E	Royal Engineers.
P R A	President of the Royal Academy.	R F A	Royal Field Artillery
pro and con	<i>pro et contra</i> , "for and against"	R H A	Royal Horse Artillery.
pro tem	<i>pro tempore</i> , "for the time being"	R I	Rhode Island
prox.	<i>proximo</i> (next month)	R I P	<i>Requiescat in pace</i> , "may he, or she, rest in peace"
P R S	President of the Royal Society.	R M	Royal Marines
P S	postscript; police-sergeant, privy seal	R M A.	Royal Military Academy
P T O	please turn over.	R M S	Royal Mail Steamer
P W D	Public Works Department	R N	Royal Navy
		R N R	Royal Navy Reserve
		R N V R	Royal Navy Volunteer Reserve
		R of O.	Reserve of Officers.

## Abbreviations

## Abbreviations

RO	Royal Institute of Oil Painters
RS	Royal Society
RSFSR	Russian Socialist Federation of Soviet Republics
RSVP	<i>répondez si vous plaît</i> please reply
Rt Hon	Right Honourable
RV	Revised Version (of the Bible)
RVO	Royal Victorian Order
RWS	Royal Water Colour Society
RY S	Royal Yacht Squadron
S.A.	South Africa South America South Australia
Salop	Shropshire
S and M	Sodor and Man (diocese)
SC	South Carolina
sc	small capitals (typography)
sc sci	<i>scilicet</i> to wit name by
S Dak.	South Dakota
SI	Sandwich Islands Staten Island (New York)
sic	so written
Sig	Signor
S.J.	Society as <i>Jesu</i> (Society of Jesus—Order of Jesuits)
SOS	distress signal.
sp	<i>sine prole</i> without issue
SI C.A.	Society for the Prevention of Cruelty to Animals
S.P.C.K.	Society for the Promotion of Christian Knowledge
SIG	Society for the Propagation of the Gospel.
sp gr	specific gravity
SI Q.R.	<i>Sena tus Pop lusque Romanus</i> (the Roman Senate and people)
SR	Southern Railway
stet	Let it stand
stg	sterling
sy	steam yacht
syn	synonym
T.C.D.	Trinity College Dublin.
temp	<i>tempore</i> in the time of (music) tempo (time)
Ten(n)	Tennessee
Tex	Texas

Toc H	Talbot House
TUC	Trades Union Congress
UDC	Urban District Council
UK	United Kingdom of Great Britain and Ireland
ult	<i>ultimo</i> (in the preceding month)
UP	under 1 roof (of spirituous liquors)
USA	United States of America
USS	United States ship
USSR	Union of Socialist Soviet Republics
Ut	Utah
v	<i>vide</i> (see) <i>versus</i> (against)
VA	Victoria and Albert Order
Va	Virginia
VAD	Voluntary Aid Detachment
VC	Victoria Cross
Ven	Venerable
verb sap	(also <i>verb sat</i> ) <i>verbum sat sapienti</i> A word to the wise is enough
viz	<i>videlicet</i> (namely)
Vt.	Vermont
WA	West Africa Western Australia
Wash	Washington (City or State)
Wis(c)	Wisconsin
WP	weather permitting
WR	West Riding (of Yorkshire)
Wyo	Wyoming
X or Xt	Christ
Y B	year book.
YMCA	Young Men's Christian Association
YWCA	Young Women's Christian Association.
ZS	Zoological Society

## SIGNS AND SYMBOLS

## Astronomical

- Sun.
- New moon.
- ☾ 1st quarter moon
- Full moon
- ☾ Last quarter moon.

# Abbreviations

☿	Mercury
♀	Venus
⊕	Earth
♂	Mars
♃	Jupiter
♄	Saturn
♅	Uranus
♆	Neptune
♁	Planet
* or *	Fixed star.
♌	Conjunction
♍	Opposition
♊	Ascending node
♋	Descending node
°	Degree of arc
'	Minute(s) of arc
"	Second(s) of arc

Jan	♈	Aquarius (the Water-bearer)
Feb	♉	Pisces (the Fishes)
March	♊	Aries (the Ram)
April	♋	Taurus (the Bull)
May	♌	Gemini (the Twins)
June	♍	Cancer (the Crab)
July	♎	Leo (the Lion)
Aug	♏	Virgo (the Virgin)
Sept	♐	Libra (the Balance)
Oct	♑	Scorpio (the Scorpion)
Nov	♒	Sagittarius (the Archer)
Dec	♓	Capricornus (the Goat)

## Mathematical

∫	integration sign
+	plus (sign of addition)
-	minus (sign of subtraction)
=	equal(s), is (are) equal to
×	multiplied by (sign of multiplication).
÷	divided by (sign of division).
>	greater than
<	less than.
is to	signs of proportion, as
so is	
to	1 2 3 6
∴	therefore.
∵	because.
√	root, as √ square root, √ cube root
'	feet (lineal)
"	inches (i.e. twelfths of a foot)

## General

& ampersand — and

&c	et cetera, "and the rest" therefore
X	ordinary strength
XX	double strength
XXX	triple strength
\$	dollar mark
/-	shilling mark, as 8/- (eight shillings)
%	per centum
^	caret or omission mark
↗	Broad arrow (British Government mark on their property, soldiers' clothes, guns, etc.)

## Typographical

4to	quarto (qto also used).
6to	sexto
8vo	octavo
12mo	duodecimo.
16mo	decimo-sexto (or sixteenmo)
18mo	decimo-octavo (or eighteenmo)
20mo	vicesimo (twenty-mo)
24mo	vicesimo-quarto (twenty-fourmo)
32mo	trigesimo-secundo (thirty-two mo)
48mo	forty-eightmo
64mo	sixty-fourmo

*	asterisk, or star	Reference signs generally used in the order given. If insufficient for the notes on a page they are sometimes used a second time by doubling each.
†	dagger	
‡	double dagger	
§	section	
	parallel	
¶	paragraph	

## ABBREVIATIONS, MUSICAL

accel	accelerando
adag	adagio
ad lib	ad libitum.
arc	arcatto
cad	cadenza.
cantab	cantabile
cello	violoncello.
C F	canto fermo.
cresc	crecendo
D C	da capo
dec	decant
decresc.	decrescendo.
dim	diminuendo.
dol	dolce.

Signs of the Zodiac

# Abd-el Kader

d	dolce
esp	espresso
f	forte (loud)
ff	fortissimo
fz	fortepiano
GO	forzando
haut.	great organ
KD	hautboy (hautboys)
L	kettledrum
leg	left
LH	l gato
LM	left hand
MD	Long Metre
MG	main droite
mf	main gauche
mod	mezzo forte
MS	moderato
ML	manuscript
ob	mezza voce
obb	oboe (hautboys)
ott. or 8va	obligato
p	ottava
ped	piano (soft)
pizz	pedal
pp	pizzicato
ral.	pianissimo
recit	ralentando
-cherz	recitativo
sen.	sch rando
sf	senza
sosten.	sforzando
spint	sostenuto
string	spiritoso
sv	stringendo
tem or temp	sotto voce
ten	tempo
tr	tenuto
tromb	trillo
uns	trombone
va.	unison
vc or vilo	viol
vv	violoncello
	violin (violins)

**Abd-el Kader** (1807?-1883) proclaimed Amir of Mascara in 1830 and led the W Algerian tribes against the French for fifteen years. He was a good leader but had to surrender in 1847. He was afterwards friendly to France, saving many Christians from massacre in 1860 and advising against the Algerian revolt in 181.

**Abd-el Krim**, leader in 191 of a terrible campaign which cleared

## Abdomen

the Rif of Spaniards. He was joined by the Jabala in 1904 but had to divert his attention from the Spanish to the French. In 19 he prepared to attack Fez but retired. He was finally crushed by the united French and Spanish forces in 1908 and exiled to Réunion.

**Abdera**, ancient Thracian town birthplace of the philosopher Democritus. Its inhabitants were alleged to be remarkable for their stupidity.

**Abdication**, the renouncement by a ruler of his throne. In England the Sovereign cannot abdicate without the consent of both Houses of Parliament.

**Abdomen, The**. In the human body the trunk is divided by the diaphragm into two cavities: the thorax or chest and the abdomen or belly. The walls of the abdomen are made up by the diaphragm above, the pelvic bones and sacrum with the muscles of the pelvis below, the spinal column and associated muscles behind, and the belly muscles at the sides and in front.

The abdomen contains almost all the alimentary tract except the oesophagus. Thus passes from the mouth through neck and thorax and into the abdomen where it terminates in the stomach. The alimentary tract may be regarded as a hollow tube of varying dimensions passing from the top of the abdomen to the bottom. It is not a straight tube but turns and twists (see DIGESTIVE SYSTEM).

Passing round the front of the alimentary canal is a membrane known as the *peritoneum* which suspends the canal from the posterior wall of the abdomen. It passes from the front of the canal round the two sides and meets again behind to pass backwards to the posterior wall of the abdomen. Here it again divides and passes round the two sides of the abdominal wall to form a lining meeting again at the centre of the anterior belly wall. This is made clear in the diagram.

From the foregoing it will be clear that the portion of the *peritoneum* which actually suspends the alimentary



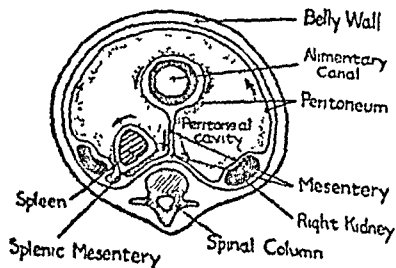
canal from the posterior abdominal wall consists of two layers, and this part is known as the mesentery. The mesentery is short in some parts, and fixes the alimentary canal firmly to the posterior abdominal wall. An example of this is seen in the case of the stomach. In other parts the mesentery is long, and allows the part

these organs firmly to the floor of the pelvis.

The peritoneum, then, enveloping as it does all organs and structures suspended in the abdominal cavity, passing over all organs and structures lying on the abdominal wall, and lining, in fact, the whole of the abdominal wall, encloses a space. This space is known as the peritoneal cavity, and contains nothing but a little fluid which acts as a lubricant.

For the sake of completeness, mention must here be made of the other structures in the abdomen. These will be found fully described under their own headings. They are the blood-vessels, chief of which is the abdominal aorta lying at the root of the mesentery immediately in front of the spinal column, the ureters, which conduct urine from the kidneys to the bladder, the bile ducts, gall-bladder, and pancreas, which lie in the posterior part of the abdomen between the liver and the intestine, and—in the female—the ovaries, which lie on each side of the uterus.

See diagrams under LIVER, URINARY



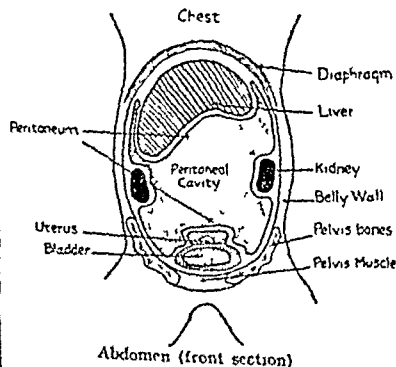
Abdomen (cross section)

of the canal which it is suspending to move freely about in the abdomen. We see this in the case of the intestines, which are anchored rather than fixed by the mesentery.

As the peritoneum passes sideways, it passes in front of the two kidneys, which lie on either side of the spinal column, and thus fixes them firmly to the posterior wall. The spleen lies in the abdomen above the left kidney, and the peritoneum is deflected from the posterior abdominal wall round the spleen and back again, so that the spleen is fixed to the posterior wall by means of its own little mesentery.

Immediately under the diaphragm in the upper part of the abdomen lies the liver. This is also held in place by means of the peritoneum, which, continuing upwards as a lining to the abdominal wall, reaches its highest point under the lower surface of the diaphragm and is then finally deflected downwards over the surface of the liver.

In a similar manner the peritoneum passes down into the pelvis and is deflected up again over the surface of the bladder and the uterus, thus fixing



Abdomen (front section)

SYSTEM, DIGESTIVE SYSTEM, and REPRODUCTIVE SYSTEM.

In the case of pain or swelling, the medical man has to reason from the facts, aided by what he knows of the history of the case, and what he can elicit from watching the progress of the

condition from hour to hour when he may be able to come to some conclusion. But even when this has been done he may still be in doubt and it may then become necessary to open the abdomen.

Apart however from the fact that the organs in the abdomen when they are diseased produce the same kind of pain and the same kind of swelling they have another most important feature in common. They are all in very close proximity to the peritoneal cavity. Because of this all disorders no matter in what organ they reside are liable to produce peritonitis a dangerous complication.

Peritonitis is inflammation of the peritoneum caused by the presence of organisms in the peritoneal cavity. Infection by micro-organisms not only means that such micro-organisms gain entrance to the tissues but also implies that such micro-organisms once they

Sometimes diseases of the female reproductive organs are a cure of peritoneal infections and it is well known that in cases of procured abortion peritonitis is the one great risk.

**Abduction**, law term denoting the forcible or unlawful removal of a person. It is a crime punishable with penal servitude or imprisonment. The consent of the person abducted if a minor is no defence.

**Abdul Hamid II** (184-1918) Sultan of Turkey (1876-1909). Fought against Serbia, Russia and Greece. Known as Abdul the Damned on account of Armenian atrocities (g.t.). Deposed by Young Turks and remained in captivity until his death.

**Abdul Mejid** (183-1839-1861) the Grand Sultan of Turkey was saved from the Egyptians by European armies. Introduced many reforms—e.g. he secured rights of person and property to all. Russia's claim to a protectorate over his country contributed to the Crimean War.

**Abdur-Rahman I** (756-788) founder of the dynasty that ruled Mohammedan Spain for three hundred years.

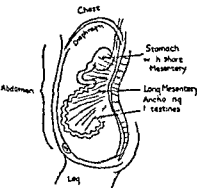
**Abdur Rahman Khan** (1845-1901) grandson of Dost Mohammed Khan and Amir of Afghanistan from 1880. Very friendly to Britain and a good ruler.

**A Beckett, Gilbert Abbott** (1811-1856) English humorist playwright and leader writer. Wrote for *Punch*, *The Times* and *Illustrated London News*.

**Abel** in the Biblical story (Gen.) the second son of Adam slain by his brother Cain because Jehovah had preferred his sacrifice to Cain's.

**Abel, Sir Frederick Augustus** (18<sup>th</sup> - 1902) Professor of Chemistry became first Director of the Imperial Institute (1887). A great authority on explosives with Prof. Dewar he invented cordite and a method of finding the flash point of petroleum.

**Abelard, Peter** (1079-1142) born near Nantes became a great dialectician. When 21 he started schools of his own. In 1116 he studied divinity



Abdomen (vertical section)

are there multiply and spread. Now by its very nature the peritoneal cavity is a most favourable residence for micro-organisms. In it they can spread and multiply very easily for the cavity offers no natural obstructions. Once inside they can spread from the diaphragm to the urinary bladder quickly easily and dangerously.

under Anselm, and opened a school of divinity in Paris with 5,000 pupils. When 36, he became tutor of Héloïse, niece of a canon in Paris, and secretly married her; she bore him a son. Her father, when she denied the marriage in Abelard's interest, had him castrated. Abelard became a monk and Héloïse a nun, and later he met her again at her convent of the Paraclete. Having permitted an unorthodox form of prayer to be used, he was condemned on an ecclesiastical charge, but, after some time, the Pope suspended the sentence.

His *Letters* to Héloïse are among the most famous love-letters in literature.

**Abelia**, semi-evergreen shrub, bearing in summer and autumn tubular purple, pink, and yellow flowers which somewhat resemble honeysuckle. Should have a warm position in the garden.

**Abeokuta** [A-BE'-O-KŌŌ-TŌ] (1) A province in S Nigeria. Pop 54,000.

(2) Town, capital of the province, with trade in timber, palm-oil, and yams; it was built by natives in the 19th cent as a refuge from slavers.

**Aberavon**, a port in Glamorgan, S Wales, with important foundry and tin works, now incorporated with Port Talbot. Pop 15,000.

**Abercrombie, Lascelles** (b 1881), poet and literary critic, lecturer in poetry and English literature at the Universities of Leeds and Liverpool. His works include *Interludes and Poems*, *Deborah*, *The Idea of Great Poetry*, etc.

**Abercromby, Sir Ralph** (1734-1801), British general who, with the Duke of York, was notably defeated by the French in Holland (1793, 1799). He died from a wound received at Alexandria while fighting the French.

**Aberdare**, town in Glamorgan on the S Wales coalfield. It has a large iron-smelting industry connected with the local coal supply, and also exports a considerable quantity of coal. Pop c 49,000.

**Aberdeen**, a royal burgh, capital of Aberdeenshire (qv), and the principal seaport of NE Scotland.

The modern town is situated at the mouth of the R Dee, the old town, which was destroyed by fire in the 11th cent, lay farther N, near the mouth of the Don. The public buildings and harbour are built of granite, and the city has a striking, if sober, beauty. The Marischal College, the Market Hall, and the Church of St Nicholas are among the many handsome buildings. Aberdeen is the seat of a university whose earliest college was founded in 1494. Textiles, flax-spinning, granite quarrying, distilling, and jute manufactures are the most important occupations. There is a valuable coasting trade, and the city is the base for the trawling fleets of NE Scotland. Pop 159,000.

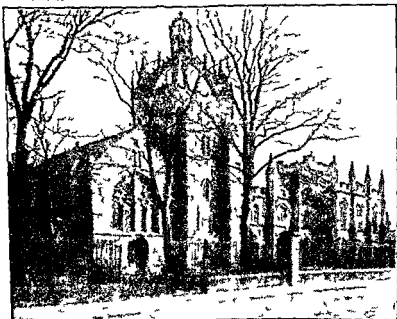
**Aberdeen Angus**, a polled or hornless hardy breed of Highland cattle. When crossed with a Shorthorn it produces an early-maturing, perfect butcher's beast. It also yields an abundance of rich milk. *Points*: black, long, deep, square body; short legs, small head, soft eyes, small bones, full, glossy coat.

**Aberdeen, Geo. Hamilton Gordon, 4th Earl of** (1781-1860), "The travelled thane, Athenian Aberdeen" (Byron). A Tory, held office under Peel, and resigned with him in 1846. Became in 1852 Prime Minister of a "Coalition Ministry," which was condemned for mismanaging the Crimean War.

**Aberdeen, John Campbell Gordon, 7th Earl and 1st Marquess of** (b 1817), English statesman, twice Lord-Lieutenant of Ireland (1886, 1905-15), Governor-General of Canada (1893-8). Created Marquess, 1915.

**Aberdeen Terrier**, see TERRIER.

**Aberdeenshire**, a Scottish county contained in the NE shoulder of the mainland between the counties of Banff, Inverness, and Perth on the W, and Kincardine and Forfar on the S. The coast-line faces E and N, making an angle between Fraserburgh and Peterhead, it is, except for the river-mouths, remarkably even. The surface is partly mountainous and partly lowland, the N. part being the



Aberdeen King's College

Cairngorm group of the Grampians a lofty granite plateau whose chief summits Ben Macdui Cairntoul Cairn gorm and Braemar are all 4 000 ft above sea level and collectively form the highest mass of elevated ground in Great Britain the N and E districts include part of the coast plain of E Scotland here about 15 m in average width There are two important rivers the Dee and the Don which flow from the Grampians and enter the North Sea on the E coast The climate of the county is equable The chief towns are on the coast Aberdeen (99) is the county town Fraserburgh and Peterhead are fishing ports Huntly is a small market town inland with some textile manufactures The principal occupations save in the city of Aberdeen are fishing the farming of small agricultural holdings and cattle

breeding The rivers are notable for their salmon and the mountains for their deer forests The population is almost wholly concentrated in the lowland parts of the county since the mountainous districts are barren and uninhabitable Pop 300 000 Area 19 189 sq m

Aberfeldy on the R. Tay a village in Perthshire Scotland the 42nd Foot later famous as the Black Watch, was formed here in the middle of the 18th cent Pop c 1 500

Abergavenny (48° 02' N) a market town of Monmouthshire Eng on the R. Usk there are iron works and the town has a local market for wool It is on the site of a Roman settlement and has some interesting antiquities Pop 1 000

Abernethy a village in Perthshire Scotland once the residence of the British king James

# Abenaki

**Abenaki**, John (1734-1821), a famous surgeon in St. Bartholomew's Hosp., 1763-1827 and especially renowned for operations for aneurism. "He was many nations' doctor, and stood by the thought that most local diseases were caused by digestive disorders. The 'Abenaki' book was named after him.

## Abenaki or Abenaki

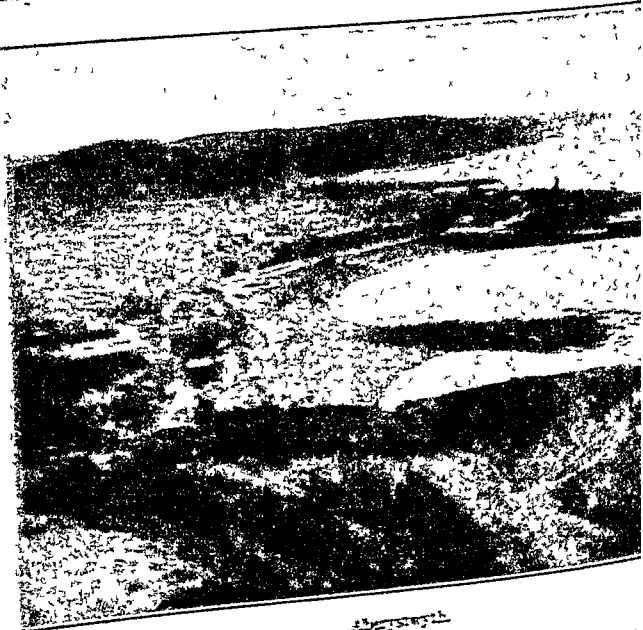
**Abenaki**, town and industrial centre, Monmouthshire, near Pontypool. Iron and tin-plate works. Pop. 15,701.

of Wales, founded 1907, headquarters here. Pop. 9400.

**Abachi**, town of French Africa, in the Lake Chad area, one of the main caravan routes of the Sahara; cap. of the Wadai. Pop. (est.) 25,000.

**Abettor**, legal term designating a person who, being himself present or assists in the commission of a crime.

**Abeyance**, in law, condition of a person, title, or office who is present owner. The term



Abenaki

**Abeyance**, in law, condition of a person, title, or office who is present owner. The term applied to peerages passing generally when, on the death of a holder, there is no male heir. In Wales it is the custom for two or more co-heiresses to hold the title until they agree to represent the title by one person to represent the title, or until the co-heiresses, or until they agree to represent the title by one person. The National Library

**Abies** (bot.) *see* **FIRS**

**Abingdon**, market town Berkshire on the R. Thames. There is a fine 15th cent. bridge and the ruins of a Benedictine Abbey. Pop. c. 7500

**Abiogenesis** *see* **BIOLOGY**

**Abjuration**, a disclaimer on oath. A law passed under William III required all holders of public office to take an oath of abjuration against the claims of the Stuarts to the throne of England. This has been abolished in favour of the oath of allegiance.

**Abkhazia**, one of the federated republics of the USSR situated in the Georgian Caucasus with an area of about 3150 sq. m. The productions are almost wholly pastoral and agricultural; maize is the most important cereal. The capital is Sukhum Kale. Pop. 200,000.

**Ablative** *see* **GRAMMAR**

**Ablution**, rite in the celebration of Mass in the Catholic Church when the priest after Communion washes his thumb and index finger in water and wine.

**Abney** Sir William De Wiveleshe (1844-1911) physicist and astronomer. President of the Royal Astronomical Society (1893-5) and of Physical Society (1893-7). From 1903 advised Board of Education and War Office. His works on stellar photography and spectroscopy are valuable.

**Abo** (or *Turku*) a provincial capital in Finland formerly the capital of the whole country. The city is an important seaport on the coast of the Gulf of Bothnia with an export trade in timber and large shipbuilding yards. It possesses a cathedral and university. Pop. 60,000.

**Abolitionists**, the name given to the extreme anti-slavery party in the United States in 1860.

**Abomey** former capital of the negro kingdom of Dahomey in W. Africa and a slave trading centre. The French conquered Dahomey in 1891 and the city is now a centre of trade in ivory, gold and palm-oil. Pop. 15,000-20,000.

**Abortion**, the deliberate procuring of

a premature expulsion of the foetus from a pregnant woman. (*See* **REPRODUCTIVE SYSTEM**.) In English law it is a crime to procure to attempt to procure or to supply the means for procuring an abortion. The maximum punishment is penal servitude for life. Abortion has been legal in Switzerland for some years and in Russia since 1917. Certain sections of public opinion in this country have for some time been pressing for the legalisation of abortion performed by properly qualified doctors.

**Aboukir** a village which gives name to a bay on the coast of Egypt N.E. of Alexandria. There are numerous remains of the old rulers of Egypt native Ptolemaic and Roman in the neighbourhood but the district is chiefly remembered for Nelson's victory over the French in 1798. 1801 Abercromby's expeditionary force landed here and later enforced the capitulation of the French army who had invaded Egypt.

**About** [A 1800] Edmond Francis Valentin (1878-1880) French journalist and novelist best known for such witty and humorous stories as *Le Poi des Montagnes* (1856) and *Cas de M. Guérin* (1862). Founded *Le XIV Sècle* in 1871. Elected French Academy in 1884.

**Abraham**, revered by the Jews as the founder both of their race and their religion. Apparently he was the leader of a tribal migration from Ur the Chaldees to Canaan. He was the first of the line of Israelite patriarchs and father of Isaac and Ishmael.

**Abraham, Plains of** (or *Heights*) the ground above the bluffs of the Lawrence west of Quebec city. 1759 Wolfe here fought a decisive battle with Montcalm which led to the capture of Quebec and brought to an end the French power in N. America.

**Abrantes** Portuguese town in valley of Tagus. Trade in wine, olives, corn and fruit. Formerly a fortified town of great strategic importance controlling the landward route to Lisbon. Junot in the campaign which led to British intervention in 1807.

in 1808, captured the town (1807), and was made Duke of Abrantes Pop c 10,000

**Abrasives** [Ū BRÄ'-SIVZ], materials used for grinding and polishing hard substances, such as metals, glass, etc. Many natural abrasives have been known from the earliest times, the commonest being quartz sand, and the hardest being the diamond. Sand is now chiefly used in the sandblast (qv), which has a large variety of applications, so-called sandpaper is made by coating paper, not with sand, but with powdered glass, and is often called glass-paper. Sand is also much used by stone-masons in working marble and other stones.

Diamond is used in the form of fine powder, the particles of which are exceedingly sharp, it is nearly always employed in conjunction with copper or soft steel, into whose surface it readily embeds itself. The hardest stones are readily cut by a rapidly rotating thin disc of steel supplied with water, and occasionally "armed" with a little diamond powder.

Softer than diamond, but still extremely hard, is emery, an impure aluminium oxide, which is very extensively applied in the form of powder, cloth, and grinding wheels. Corundum is a purer variety of emery.

The most important artificial abrasive is carborundum, a compound of carbon and silicon, made by heating coke and sand in the electric furnace. It has similar properties to emery, but is rather harder.

Polishing of glass and metal is effected by following up the use of hard materials, such as emery and carborundum, in the finest possible form, by that of softer substances such as rouge (oxide of iron), putty powder (oxide of tin), etc. (see POLISHING, GRINDING).

**Abreaction**, see PSYCHO-ANALYSIS.

**Abrogation** (law), the total annulment of a law or a treaty, either expressly or by implication, as when another law or treaty conflicts with the first.

**Abruzzi** [AB-RŪ'TSE], Luigi Amadeo, Duca di (1873-1933), mountaineer and explorer, scaled peaks in Alaska and Central and E. Africa, and under took a Polar expedition in 1900. Commander of Italian Navy, 1913-17.

**Abruzzi and Molise**, territorial division of Central Italy, extending from the central Apennines to the Adriatic coast. The limestone Abruzzi mountains rise to 9000 ft at their highest summits. The district is pastoral, with vineyards on the lower slopes, and cereals are grown on the lower ground by the Adriatic. Pop. 1,500,000, area, 6390 sq m.

**Abscess**, a collection of purulent matter in the tissues of the body. When present in the skin, it takes the form of a boil, or, if larger, of a carbuncle. It may, however, be more deeply seated and present in almost any part of the body, common examples being brain abscess, bone abscess, and abscess round the kidney, or perinephric abscess. When it occurs in the thorax between the lung and the chest wall, it is called empyema, but located in the lung itself, it is called a lung abscess. When it is present in the abdomen, in the region of the appendix, it is called an appendix abscess, or *appendicitis* (qv). An abscess in the tonsil is called a quinsy. Abscesses often form inside the blood-vessels of the spleen or the kidneys, and are then called infarcts.

The most common cause of abscess formation is the germ *Staphylococcus pyogenes*, a small, round-bodied germ growing in clusters resembling grapes and characterised by its pus-producing properties. These organisms are constantly present on the healthy skin, but if the skin is not kept clean gain entrance to its deeper layers and there multiply. The immediate response in the tissues is a dilatation of the neighbouring blood-vessels, so that the part becomes locally engorged with blood, a state which is called hyperæmia. Subsequent to this, the white blood cells begin to accumulate in the blood-vessels at the site, and eventu-

ally become so numerous as to completely block the flow of blood the condition being known as stasis. In the third stage the blood vessels begin to exude both blood plasma and white blood cells into the tissues infected with the germ. The white blood cells now begin to devour and destroy the germs. But the surrounding tissues deprived of their blood supply by reason of the stasis in the blood vessels also become mortified with the result that a soft purulent mass is formed. This is what is known as pus and the cavity in which it is contained is spoken of as the abscess. While this process has been going on the surrounding tissues have become distended by the development and presence of the unaccustomed abscess the pressure gives rise to tenderness or pain which is accentuated if further pressure is exerted on the overlying skin. Eventually the vitality of the skin becomes so impaired that it breaks and the pus flows on to the surface. This immediately relieves the pain, and by degrees the tissues undergo repair or what is known as resolution.

**Absenteeism** a state in which land and estate-owners live away from their property while deriving income therefrom. This lack of supervision has many times and places—notably in France and in Ireland in the 18th cent.—caused a degeneration of agriculture and various laws have at times been passed to combat it.

**Absinthe**, see **LIQUORS**

**Absolution** (1) The remission of sins pronounced by a priest in the Christian Church after Confession. (2) The release from a sinner of his guilt. (3) The release from censure used in the Catholic Church whereby penalties imposed by the Church are removed.

**Absolutism**, the personal and arbitrary rule of a monarch without any institutional form of government. A typical form in the Middle Ages it is died out in most civilised countries. In the modified form of dictatorship.

**Absorption**, see **COLLOID CHEMISTRY**

**Abstract of Title** (law) a summary of the principal facts and documents affecting a title to land generally prepared for the information of an intending purchaser.

**Abu Bekr** (57 ?-634) 1st Caliph of Islam father-in-law of Mohammed successfully coped with a troubled caliphate and by defeating Heraclius the Byzantine Emperor added Syria and part of Persia to his domain. He produced the official text of the Koran (qv) after collating the variant versions that had been in circulation since Mohammed's death.

**Abu Klea**, village in the Anglo-Egyptian Sudan where Sir Herbert Stewart who commanded the column which attempted to relieve Gordon in Khartum won a victory over 5000 Mahdists in 1885 in which he himself was mortally wounded.

**Abulfeda** (1273-1331) Mo'lem prince. Successful in wars against Crusaders and Tatars he was made king of Hamah in 1310. Wrote a valuable universal history which provides much of our knowledge of the Saracens.

**Abu Nuwas** (c. 750-810) one of the finest Arabian lyric poets. He was a pioneer in the reaction against the conventional form of poetic elegy. His genialty and poetic excellence kept him in the favour of Harun al Rashid (qv) in spite of his very thorough indulgence in wine and debaucheries. Many anecdotes are recorded of him in the *Arabian Nights* and elsewhere.

**Ab Urbe Condita** [**AB ÆRIBI KONDITAN**] also *anno Urbis conditæ* the Latin phrase meaning from the foundation of the City or in the year since the foundation of the City (Rome) and usually abbreviated to **A.U.C.** a phrase used to indicate the method by which the Romans reckoned their years. Rome was founded in 753 B.C. therefore a year reckoned by the Roman chronology can be reduced to the reckoning of the Christian era by subtracting it from 753 if it is smaller than that number (in which case



year is B C), or by subtracting 753 from the year if it is larger than that number (when the year is A D) See also CALNDAR

**Abuse of Process (law)**, the bringing of vexatious actions. The court can dismiss an action which appears to be frivolous, and any person who habitually institutes legal proceedings without reasonable cause may be restrained from so doing by an order of the court. A person aggrieved by a malicious criminal prosecution, bankruptcy, or liquidation proceedings, or arrest, made without reasonable cause, may bring an action for damages.

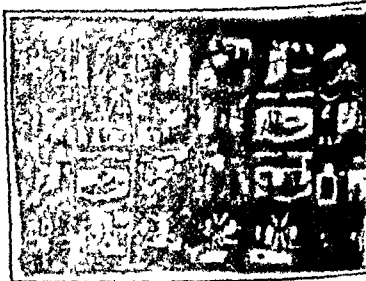
**Abutilon** [Ū-BŪ'-TĪ-ŪN] (*Lantern Flower*), greenhouse and bedding-out shrub, resembling the mallow, with handsome veined leaves and pendulous flowers on slender stems. Good fibrous loam, leaf mould, well-rotted manure, and sand is a good soil compost, and the plants should be grown in 7-in pots. May be bedded out in summer and will continue flowering under glass in winter.

**Abydos**, ancient city on the Asiatic shore of the Hellespont or Dardanelles, opposite Sestos. Leander, in the classical legend, swam across nightly to visit his lover Hero until he was drowned. According to Herodotus, Xerxes, the Persian despot, bridged the narrows at this point in his invasion of Greece (480 B C).

**Abyssinia** (or *Ethiopia*), a Christian empire in N E Africa, now completely surrounded by the possessions of European Powers. Italy, France, and Great Britain occupy the low country of Somaliland between the Gulf of Aden and the E border of the empire. Eritrea denies access to the Red Sea on the N E. Anglo-Egyptian Sudan lies on the W, Uganda and Kenya on the S. complete the containing ring. Abyssinia is roughly triangular in shape, with the base to the S lying approximately between 6° N and 15° N, 35° E and 45° E, and comprising an area of some 400,000 sq m.

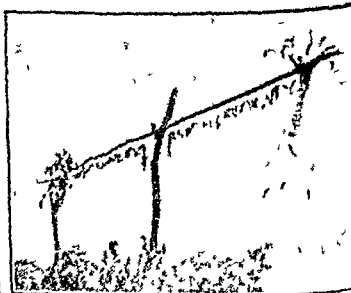
Geologically, Abyssinia is a continuation of the E. African tableland, the

greater part of the interior is occupied by a lofty plateau deeply incised by the river valleys, but the S E districts, which include about a third of the area, are lowland, and are part of the Somaliland plain. The plateau



Abyssinian Art. Life of the Queen of Sheba. needlework panel

terraced on its N side, elsewhere the rim rises abruptly from the surrounding plain, there are several mountain ranges in the interior, rising to 15,000 ft in the Simen range of N W. The general slope of the plateau is to the N and W, and the principal rivers flow to the Nile. The Blue Nile is the most important, it joins the Nile near Omdurman. Others are the Atbara, the Sobat, the Og



Abyssinia. Warrior's Grave, with 160 hut trophies, one to represent each foe slain.

and the Hawash. All the rivers are of variable depth according to the season and from the nature of the terrain useless for navigation. The W

carry down large deposits of alluvium to the Nile valley

Abyssinia is entirely within the N tropical zone but climatic conditions are greatly modified by elevation. Above 5000 ft on the tableland is a healthy sub-tropical zone having rather cold nights on the higher mountains alpine and in a few cases arctic conditions prevail. The low land of Somaliland have a tropical climate hot and dry the deeper valleys of the plateau are all a very hot

cane are found the coffee plant is a native of the S W. The kosso tree with its striking red blooms grows extensively on the plateau. The animal life resembles that of the African continent generally (see AFRICA) beasts of prey crocodiles etc are found in the lower country. Antelopes are abundant in the middle region as are herds of zebras and onagers. Birds of prey inhabit the highlands and there is a rich bird life of the sub-tropical order. The ostrich is common. Snakes are few.

Abyssinia is almost entirely occupied in primary production. The minerals are important but only a little gold is exported. Coffee alone is cultivated at all extensively some cotton cereals and a little sugar-cane are grown. Horses sheep and goats are bred. Hides and skins are exported. Although a railway has been constructed from Addis Ababa to Jibuti a port in French Somaliland trading conditions in Abyssinia are of a periodic nature not unlike the great fairs of Continental Europe in the Middle Ages. Road are being developed but most of the country is connected up by primitive trackways unsuitable for wheeled traffic. The rail way is under French management and the telegraph lines (about 5000 m.) under Italian direction.

The natives of Abyssinia are of mixed race and the types vary somewhat in different parts of the country. The basic stock is apparently the same as that of Egypt with negro and Semitic infiltrations. The government is regulated by the Constitution of 1931. The executive power is vested in the Emperor (or Negusa Nagast) who is advised by two chambers of nominees. The reigning dynasty claims descent from King Solomon and the Queen of Sheba. Pop according to the latest estimate c 10 millions.

Abyssinia was from early times associated with the fate of Egypt. Sometimes an Egyptian dynasty extended its authority to Ethiopia, but on the whole the inaccessibility of the



Abyssinian lives.

and sometimes swampy and febrile. Rainfall is confined to mid summer and early autumn and the atmosphere is extraordinarily clear on the tableland. Flora and Fauna. The lowlands of the S E are very largely desert whilst the high ground of the tableland especially its N portion consists of open downs sparsely covered with bushes and occasional trees. The hills of the N are heavily wooded but in the S there is a very varied flora. Conifers (yellow pine) Mediterranean fruit trees (orange olive etc) gum trees cotton indigo even sugar

country has made for independence. Abyssinia was Christianised by a missionary from Alexandria, one Frumentius, in the 4th cent., but although the Mohammedan onset in A.D. 640 ruined the Alexandrian Church, Abyssinia has managed to preserve through the centuries a Christianity barbarised but intact.

In the early 6th cent. A.D. Abyssinian power was extended to the neighbouring coasts of Arabia, and a large trade grew up. This development was cut short by the victories of the Mohammedan Arabs, and from that time Abyssinia remained in the solitude of her upland fastness. Mediæval Christian Europe located the realm of Prester John (*q.v.*) in Ethiopia as well as in the unknown East, and at the end of the 15th cent. a Portuguese mission, searching for the mythical ruler, arrived in the country. The Portuguese later helped to repel a last determined attempt at Mohammedan conquest. The Abyssinian Church resisted the Jesuit attempt of the 16th and 17th cents. to bring it under the control of the papacy, and still acknowledges the authority of the Coptic Patriarch of Alexandria. After the decline of Portuguese power the empire again lapsed into isolation. Poncet visited it at the close of the 17th cent., and Bruce in 1769-70. In 1806 a British diplomatic mission negotiated an alliance. Various Protestant missions followed in the 19th century.

In the mid-19th cent. an Abyssinian chief led a successful revolt against the reigning king and became the Emperor Theodore. An apparent discourtesy on the part of the Foreign Office led Theodore to imprison the British residents. Failing to secure their release, the British Government despatched an expedition in 1867 under Sir R. Napier, which defeated Theodore and stormed Magdala. Theodore committed suicide, and the British evacuated the country.

Abyssinia next came into conflict with Italy, which had gained a foothold on the Red Sea coast in 1870. After

a prolonged struggle, in which the Italians were worsted, Abyssinian independence was recognised, though Italy retained Eritrea (1896). The struggle drew European attention to the development of the country. In 1906 France, Britain, and Italy agreed as to their joint relationship in Abyssinia. Political conditions, despite the strong government of Emperor Menelek, are still unstable, but Abyssinia joined the League of Nations in 1923 and a constitution was granted in 1931.

**Acacia** [Ū-KA'-SHŪ], a leguminous tree or shrub of several species, of which the *Acacia dealbata* or mimosa of early spring is the type. There are several species, easily raised from seeds, and the plants soon grow into large specimens for the greenhouse. *A. lophantha* and *A. armata* are good species. These three acacias may be housed in a temperature no higher than 40°, and can be treated as cool greenhouse climbers. Acacias produce gums and barks for commercial purposes.

**Académie Française**, see **ACADEMY**. The French Academy had an informal beginning about 1629, and was formally established in 1635. The membership was limited to 40, who are known as the "Immortals," and it quickly became recognised as a body of official literary critics, and as the supreme authority on all matters connected with French language and literature. No word has won its final right of entry into the French language until it has received the official approval of the *Académie*. The Academy also publishes the official French Dictionary, and awards prizes for outstanding literary performances. Its official French Grammar, published in 1932, aroused serious criticism.

**Academy**, derived from the title of a public garden outside Athens, named after the ancient hero Academus, where Plato delivered his discourses to his disciples. The school of philosophy which he established there continued to flourish until Justinian closed the Athenian schools.

in 509 A.D. though the Platonic doctrine gave way to scepticism and agnosticism and later to stoicism. The date was identified in 1933.

The name academy came to be applied to a number of institutions generally official for the promotion of art and learning. One of the most notable of the early academies was that founded by Cosimo de Medici in the 15th cent. known as the *Accademia Platonica* and during the 17th cent. academies of fine arts of letters and of science were established in most of the countries of W. Europe. The *Académie Française* (q.v.) was founded in 1635, the *Académie Royale de Peinture et de Sculpture* in 1648 and the *Académie des Sciences* in 1666. All of these now form part of the *Institut Français*.

In Germany a number of similar bodies arose about the same time though the word academy does not appear in their titles. While in England the Academy of Ancient Music was founded in 1710, the Royal Academy of Music in 1820, and the Royal Academy of Arts in 1768 and several others have come into existence since then.

**Academy of Arts, Royal**, the name of a society founded by George III in 1769 for the encouragement of painting, sculpture and architecture. Its first president was Sir Joshua Reynolds and the first home of its exhibitions and classes was at Somerset House. In 1834 it removed to Trafalgar Square and in 1869 to Burlington House its present home. There are 40 members or Academicians of whom 10 serve with the president as a Council. 4 of them retire each year. Academicians are elected from among the Associate Members and have to present an example of their work. These examples hang in the Diploma Gallery. A winter exhibition is held annually of the works of deceased artists and the R.A. exhibition each summer consists of the works of living artists. Schools of sculpture, painting and architecture are carried on admission being by

competition and the duration of the courses 5 years. The Academy also administers a certain number of bequests and helps needy artists and their dependents. There is a fine library of books on art and an annual report is issued. Among the most notable Presidents following Reynolds have been Lawrence (1800-30), Leighton (1878-96) and Millais (1896).

**Acadie** [A KAH DE] former name of a district in S.E. Canada. The French gave the name to their colonial possessions S. of the St. Lawrence river. At the close of the War of the Spanish Succession in 1713 Great Britain acquired Acadie which has since been absorbed in the provinces of New Brunswick and Nova Scotia.

**Acalypha** [A KAL IFU] (*Ped hot* (ai-tail)) a plant from the E. Indies for the greenhouse 4-6 ft. high with large leaves broad at the base and tapering to the long points characteristic of tropical plants. The long, furry red tails are produced in the axils of the leaves and are often 6 ft. long.

**Acanthopanax** [A KAN THO PAN AS E] a deciduous Chinese shrub with large ornamental leaves for which it is chiefly cultivated.

**Acanthus** [O KAN THUS] perennial plant with snapdragon-like flowers and large leaves. Ordinary garden culture required. The acanthus family is a large family of dicotyledonous herbaceous plants and shrubs abounding in tropical regions. Many species of *Jussiaea*, *Pilea* and *Aphelandra* are cultivated in hothouses on account of their showy flowers. A valuable deep-blue dye is obtained from a species of *Ruellia*. In classical architecture the acanthus leaf was used on the capital of the Corinthian column.

**Acarmania** [A KAH NA NI O] a region of ancient Greece bounded on the N. by the Gulf of Arta, on the W. and S.W. by the Ionian Sea, at one time the theatre of the activities of a federal league similar to the Aetolian League (q.v.). In the Greek War of

## Abyssinia

country has made for independence Abyssinia was Christianised by a missionary from Alexandria, one Frumentius, in the 4th cent, but although the Mohammedan onset in A.D. 640 ruined the Alexandrian Church, Abyssinia has managed to preserve through the centuries a Christianity barbarised but intact

In the early 6th cent A.D. Abyssinian power was extended to the neighbouring coasts of Arabia, and a large trade grew up. This development was cut short by the victories of the Mohammedan Arabs, and from that time Abyssinia remained in the solitude of her upland fastness. Mediaeval Christian Europe located the realm of Prester John (*qv*) in Ethiopia as well as in the unknown East, and at the end of the 15th cent a Portuguese mission, searching for the mythical ruler, arrived in the country. The Portuguese later helped to repel a last determined attempt at Mohammedan conquest. The Abyssinian Church resisted the Jesuit attempt of the 16th and 17th cents to bring it under the control of the papacy, and still acknowledges the authority of the Coptic Patriarch of Alexandria. After the decline of Portuguese power the empire again lapsed into isolation. Poncet visited it at the close of the 17th cent, and Bruce in 1769-70. In 1806 a British diplomatic mission negotiated an alliance. Various Protestant missions followed in the 19th century.

In the mid-19th cent an Abyssinian chief led a successful revolt against the reigning king and became the Emperor Theodore. An apparent discourtesy on the part of the Foreign Office led Theodore to imprison the British residents. Failing to secure their release, the British Government despatched an expedition in 1867 under Sir R. Napier, which defeated Theodore and stormed Magdala. Theodore committed suicide, and the British evacuated the country.

Abyssinia next came into conflict with Italy, which had gained a foothold on the Red Sea coast in 1870. After

a prolonged struggle, in which the Italians were worsted, Abyssinian independence was recognised, though Italy retained Eritrea (1896). The struggle drew European attention to the development of the country. In 1906 France, Britain, and Italy agreed as to their joint relationship in Abyssinia. Political conditions, despite the strong government of Emperor Menelek, are still unstable, but Abyssinia joined the League of Nations in 1923 and a constitution was granted in 1931.

**Acacia** [Ū-KA'-SHŪ], a leguminous tree or shrub of several species, of which the *Acacia dealbata* or mimosa of cultivation is the type. There are several species, easily raised from seeds, and the plants soon grow into large specimens for the greenhouse. *A. lophantha* and *A. armata* are good species. These three acacias may be housed at a temperature no higher than 40°, and can be treated as cool greenhouse climbers. Acacias produce gums and barks for commercial purposes.

**Académie Française**, see ACADEMY. The French Academy had an informal beginning about 1620, and was formally established in 1635. The membership was limited to 40, who were known as the "Immortals," and quickly became recognised as a body of official literary critics, and as supreme authority on all matters connected with French language and literature. No word has won its final right of entry into the French language until it has received official approval of the Academy. The Academy also publishes the *Grand Dictionnaire de la Langue Française*, the French Dictionary, and awards prizes for outstanding literary performances. Its official French Grammar, published in 1932, aroused serious criticism.

**Academy**, derived from the name of a public garden outside Athens, named after the ancient hero Akademos, where Plato delivered his lectures to his disciples. The Academy of philosophy which he established there continued to flourish until Justinian closed the Athenian

in 509 A.D. though the Platonic doctrine gave way to scepticism and agnosticism and later to stoicism. The site was identified in 1933.

The name academy came to be applied to a number of institutions generally official for the promotion of art and learning. One of the most notable of the early academies was that founded by Cosimo de Medici in the 15th cent. known as the *Accademia Platonica* and during the 17th cent. academies of fine arts of letters and of science were established in most of the countries of W. Europe. The *Académie Française* (qv) was founded in 1635, the *Académie Royale de Peinture et de Sculpture* in 1648 and the *Académie des Sciences* in 1666. All of these now form part of the *Institut Français*.

In Germany a number of similar bodies arose about the same time though the word academy does not appear in their titles while in England the Academy of Ancient Music was founded in 1710, the Royal Academy of Music in 1792 and the Royal Academy of Arts in 1768 and several others have come into existence since then.

**Academy of Arts, Royal**, the name of a society founded by George III in 1768 for the encouragement of painting, sculpture and architecture. Its first president was Sir Joshua Reynolds and the first home of its exhibitions and classes was at Somerset House. In 1831 it removed to Trafalgar Square and in 1869 to Burlington House its present home. There are 40 members or Academicians of whom 10 serve with the president as a Council, 4 of them retiring each year. Academicians are elected from among the Associate Members and have to present an example of their work. These examples hang in the Diploma Gallery. A winter exhibition is held annually of the works of deceased artists and the R.A. exhibition each summer consists of the works of living artists. Schools of sculpture, painting and architecture are carried on admission being by

competition and the duration of the courses 5 years. The Academy also administers a certain number of bequests and helps needy artists and their dependents. There is a fine library of books on art and an annual report is issued. Among the most notable Presidents following Reynolds have been Lawrence (1820-30), Leighton (1878-96) and Millais (1896).

**Acadie** [A KA DE] former name of a district in S.E. Canada. The French gave the name to their colonial possessions S. of the St. Lawrence river. At the close of the War of the Spanish Succession in 1713 Great Britain acquired Acadie which has since been absorbed in the provinces of New Brunswick and Nova Scotia.

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Independence (1821-24) it was a leader among the revolting provinces. It is now incorporated with its ancient foe, Ætolia. Pop 200,000.

**Acceleration**, *see* DYNAMICS

**Accelerometer**, apparatus for measuring acceleration. An ordinary pendulum damped will, if hung up in any vehicle, indicate the acceleration at any instant by its deflection, a weight free to slide in the direction of the motion of the vehicle and constrained by a string will likewise indicate acceleration by deflection. A liquid in a U-tube, with its plane parallel to the direction of motion, can likewise be used. Accelerometers are used only in testing power-driven vehicles for experimental purposes.

**Accent and Quantity**. It is the fact that one syllable differs from another in sound value that makes rhythm in language possible, for without such differentiation speech would consist of a monotonous succession of sounds of uniform length, stress, and pitch. In spoken language the musical pitch or tone of a syllable plays a very important part—an essential part, indeed—in some languages, such as Chinese, but in written literary language the most important means of establishing a rhythmical succession of syllables are accent and quantity. These form an essential part of the rhythm of prose, but it is by their use in verse that their nature is best understood. The quantity of a syllable is the length of time it takes to utter it, accent is the amount of vigour expended upon its utterance without regard to the time this takes.

Generally speaking, classical verse, Greek and Latin, was primarily quantitative, and most modern verse is primarily accentual, although accent and quantity had, and have, their respective places in each type of verse. In quantitative verse the rhythm depends upon a certain arrangement of long and short syllables, and the relative length and shortness of the syllable is determined by reference to two considerations. Some vowels were

regarded as long *by nature*; others as long *by position*, the voice being compelled to dwell upon them by reason of their preceding certain consonantal combinations. By way of illustration the *i* in *this* would be regarded as short in the combination *this arm*, but long in *this strength*.

Nearly all modern verse is accentual though the predominance of accent over quantity varies considerably in different languages. In the case of English, with its marked and stable accent, the part played by quantity is of very minor importance, and the bulk of English verse, even that written in imitation of classical quantitative verse, consists of a regular arrangement of stressed and unstressed syllables. *See also* RHYTHM.

The term accent is also used to designate various diacritical marks used, in many languages, to indicate the quality of certain vowel sounds. These were used in ancient Greek but they are more generally familiar in the French *acute* (´), *grave* (`), and *circumflex* (^) accents.

**Acceptance**: (1) The act of accepting a bill of exchange. (2) The bill itself after it has been accepted. When a bill of exchange is drawn on a merchant who has bought goods under contract to pay 3 or 6 months after delivery, the bill is sent to the drawer at time of delivery of the goods. He then *accepts* the bill by writing and stamping the word "accepted" on it, and adding his signature. *See also* BILL OF EXCHANGE.

**Acceptance House**, a financial house or large merchant firm well known to merchants abroad, which does business in accepting bills on behalf of our smaller firms, for a consideration. The accepting house, by accepting the bills, takes over the responsibility for meeting the payment when due. As it is well known to traders abroad, its acceptance makes the bill readily discountable. *See also* BILL OF EXCHANGE, MONEY MARKET.

**Accessory**, *see* CRIMINAL LAW.

**Accidence**, *see* GRAMMAR.

## Acclimatisation

**Acclimatisation (biol.)** the adaptation of organisms to climatic change. The adaptation may occur in the individual suffering the change or may appear in subsequent generations. It may be manifested by increased somatic vigour, reproductive power, altered periodicity or changes in colour and behaviour.

In temperate countries peach trees shed their leaves annually and when planted in Réunion continued their periodic leaf fall for some years. Gradually the time of retention of leaves increased until about twenty years later some leaves were always present on the tree. Acclimatisation had thus been effected in this respect.

Rabbits and thistles introduced into Australia provide familiar examples of successful acclimatisation. In New Zealand watercress attains the dimensions of a shrub and several species of European birds have multiplied extensively and now form part of the wild fauna of that country.

Successful acclimatisation may not be conditioned solely by climate. Abundant food, the help of man and absence of enemies are factors aiding acclimatisation. See also ADAPTATION.

**Accolade** (1) The act of touching the shoulder or side of the neck with the flat of the sword in conferring knighthood. Earlier forms were a blow struck lightly on cheek or neck and the embrace that is still described as an accolade in France and that accompanies the award of any decoration or distinction in that country. (2) In architecture an ornament appearing on doors and windows. (3) In music a brace connecting separate staves.

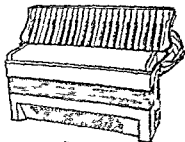
**Accomplice** one who assists another to commit a crime. An accomplice may give evidence against his fellow criminal; this is called turning King's evidence.

**Accord and Satisfaction** In law a right of action for a tort or a breach of contract may be discharged by the one party giving and the other accepting some legal consideration in substitution for the right.

## Accountant

This is called accord and satisfaction.

**Accordion**, a portable musical instrument invented by Damian of Vienna in 1809 which produces sounds by the combination of a hand bellows and



Piano-Accordion.

free reeds. The piano-accordion is an elaboration of the original type with a keyboard more like that of a piano and various sets of reeds. It is known in Argentina as the *bandoneon* and is much used there by dance orchestras.

**Account**, in commerce a statement as to pecuniary transactions during the amount due from one person to another. An account closed is one in which both parties have agreed to the balance due. See also *BOOK-KEEPING*.

**Accountant**, one having an expert knowledge of the keeping of financial accounts, the drawing up of balance sheets etc. chiefly as a consultative and organising part of work. Accountancy is the science of recording all operations and their results numerically and in the broadest sense would include all services as expert investment of and advice upon financial operations connected with such operations.

There are many societies of Accountants in the British Isles, the most important being the three Institutes of Chartered Accountants of England and Wales, Scotland and Ireland, the Corporation of Accountants, the London Association of Accountants and the Society of Incorporated



Accountants and Auditors These bodies hold examinations which qualify the successful candidates as Accountants

**Accra**, capital of the British colony of the Gold Coast, W Africa Accra is connected by rail with Kumasi, the old Ashanti capital, and is an important seaport on the Gulf of Guinea, exporting rubber, ivory, gold, cacao, timber, and diamonds There is cable connection with Europe and S Africa, and a wireless station Two battles between British and native troops took place there during the first Ashanti War (1824 and 1826) Pop c 40,000

**Accrington**, municipal and parliamentary borough in Lancs, 23 m N W of Manchester It is one of the new towns of the Industrial Revolution, specialising in spinning and mill machinery Pop 43,000

**Accumulation** (law), the continuous adding of interest to a fund for the benefit of some person in the future This was formerly permitted, provided the accumulation did not offend against the Rule against Perpetuities At the end of the 18th cent, however, a Mr Thelusson made an eccentric will directing an accumulation that was expected to produce about £100 million In consequence, the Thelusson Act, 1800, was passed, which directed that only accumulations during one of the following periods were valid (a) the life or lives of the settlor or settlors, (b) a term of 21 years from the death of the settlor, (c) the minority of any person living or *en ventre sa mère* at the death of the settlor, (d) the minority of any person who, under the limitations of the settlement, would if of full age, be entitled to the income directed to be accumulated See also PERPETUITIES, RULE AGAINST

**Accumulator**, see BATTERY, ELECTRIC

**Accumulator** (hydraulic), apparatus by which power in the form of high-pressure water is stored up for use when a sudden demand is made It

may consist of an apparatus similar to a hydraulic press (*qv*), by which a weight is raised, or of a simple chamber into which water is pumped, thereby compressing the air

**Accusative**, see GRAMMAR

**Ace**, a playing-card with a single pip, in most games (*eg* bridge) counting highest of all Also one at dice, or a single point in lawn-tennis and other court games

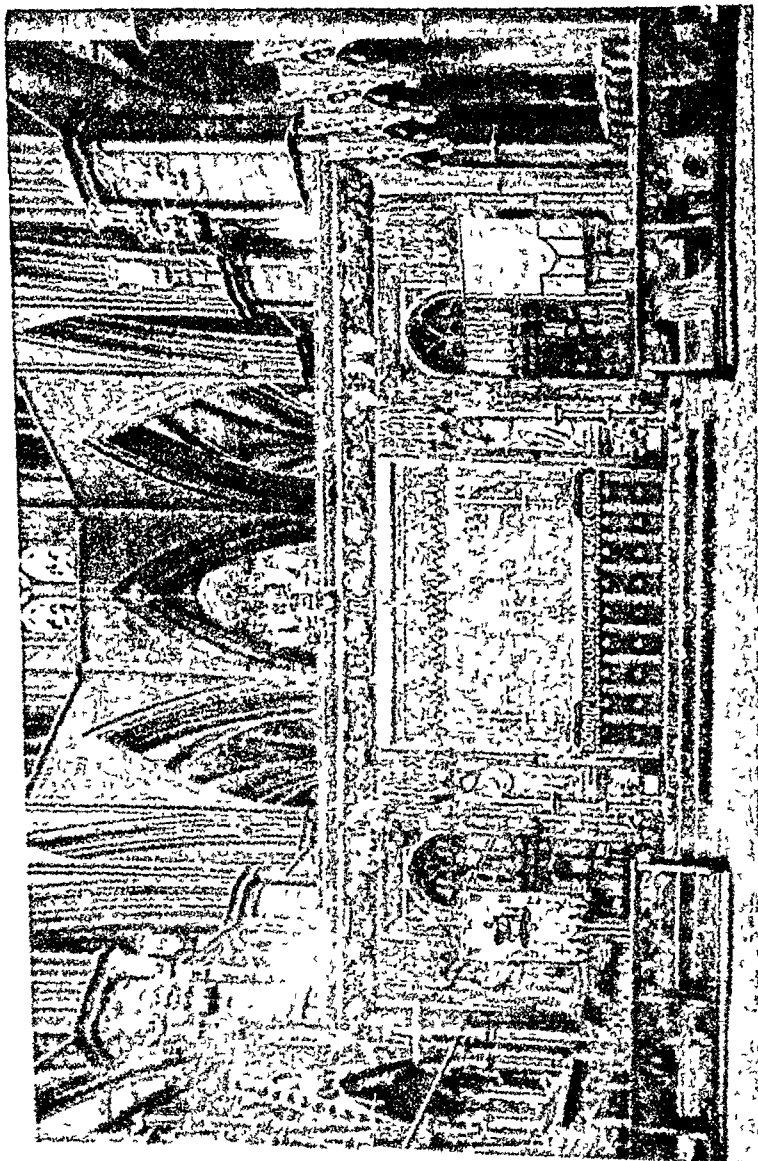
From its use in cards, the word has been applied (originally in France) to one who excels in a particular branch of sport, especially in flying

**Acer**, see MAPLES

**Aceraceæ** [A-SŪ-RĀ-SI-E], the maple family of plants Sycamore and maple are types

**Acetaldehyde** [ASETAL'DIHID], or *ethyl aldehyde*,  $\text{CH}_3\text{CHO}$ , is a water-white mobile inflammable liquid possessing a characteristic odour Its boiling-point is  $21^\circ\text{C}$ , melting-point,  $-121^\circ\text{C}$  It is manufactured by the oxidation of ethyl alcohol by means of an oxidising agent, such as potassium dichromate, in the presence of sulphuric acid It may also be manufactured by the catalytic oxidation of acetylene, the latter is passed into sulphuric acid containing a little mercuric sulphate which acts as the catalyst Small amounts are also obtained from the "first runnings" of alcohol stills Acetaldehyde finds considerable use in the manufacture of various organic chemicals, such as plastic materials and dye intermediates It is also used as a solvent and for the treatment of nasal catarrh If acetaldehyde is mixed with concentrated sulphuric acid it polymerises with the formation of *paraldehyde*,  $(\text{CH}_3\text{CHO})_3$ , which is used in medicine as a soporific; it suffers from the disadvantage of an unpleasant odour. In the presence of potassium carbonate acetaldehyde condenses to *aldol*  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CHO}$ , which is in perfumery and in the manufacture of rubber vulcanisation accelerators. **Acetanilide** [ASETAN'ILID], or *phenyl acetamide*, is a chemical comp





of formula  $C_2H_3NHCOCH_3$ . It is prepared by boiling aniline with acetic acid and is used in medicine as a febrifuge under the name of *anti febrin* and also as an analgesic. It is soluble in hot water. Melting point  $114^\circ C$ .

**Acetic (Asetic) Acid,  $CH_3COOH$**  is perhaps the most important organic acid. It has long been known since vinegar is merely an impure diluted acetic acid.

There are three main processes in use to-day for the manufacture of acetic acid on an industrial scale. The oldest is the fermentation process by which the acid is obtained in the fermentative oxidation of dilute ethyl alcohol usually in the form of spirituous liquors. This is the process that is chiefly used for the manufacture of vinegar. The oxidation of pure ethyl alcohol to acetic acid is now also carried on by catalytic methods and this means of preparing the acid is increasing in popularity. The most modern method for the manufacture of the acid is an entirely synthetic one. Acetylene which is obtained by the action of water on calcium carbide is catalytically oxidised to acetaldehyde which is subjected to a second stage of catalytic oxidation, with the resulting formation of acetic acid.

The third (less important) method of production consists in recovering the acid in the form of calcium acetate from the liquors obtained by the destructive distillation of wood and vegetable wastes. The pure anhydrous (glacial) acid has a melting point of  $16.7^\circ C$  and boils at  $118^\circ C$ . The vapour of the acid is inflammable. Acetic acid is used in numerous ways in the chemical industry as a solvent in the manufacture of medicines and other synthetic products and in the textile industry.

**Acetic Ether** the popular name for ethyl acetate ( $CH_3COOC_2H_5$ ).

**Acetacetic Ester** ( $CH_3COCH_2COOC_2H_5$ ) or more correctly ethyl acetoacetic acid is a liquid organic compound with a characteristic "fruity" smell

and a boiling point of  $191^\circ C$ . Its melting point is  $-48^\circ C$ . The substance is prepared by the action of sodium on ethyl acetate and it has great use in organic chemistry. It is the starting point of a large number of syntheses, particularly a greater number than any other organic compound.

**Acetone ( $CH_3COCH_3$ )** or dimethyl ketone is an organic chemical liquid having a pleasant characteristic odour. It boils at  $56^\circ C$  and freezes at  $-94^\circ C$ . The chemical formula is  $CH_3COCH_3$ .

There are three principal methods of obtaining this compound:

(1) By the destructive distillation of calcium acetate. (2) It is a by-product method and is still somewhat impractical.

(3) By the action of certain ferments on starchy substances when butyl alcohol ( $CH_3CH_2CH_2CH_2OH$ ) and acetone are produced. This method is the most of being employed provided that there is a market for the butyl alcohol.

(4) By the catalytic process with acetic acid when the latter is present over catalyst.

Acetone is widely used as a solvent. It is a particularly good solvent for cellulose esters and is thus used in artificial silk and in the lacquer industry. It is also employed in the manufacture of ethyl acetate. Acetone is an excellent solvent of acetylene and is the means of obtaining the latter to be safely used.

**Acetophenones** ( $CH_3COCH_2C_6H_5$  or phenyl methyl ketone) is an organic compound having the formula  $C_8H_8O$ . It is a crystalline substance with a pleasant odour, melts at  $20^\circ C$  and boils at  $201^\circ C$ . It is prepared by the action of acetyl chloride on benzene in the presence of aluminium chloride. It is used in perfumery and under the name hyponic in the dye industry.

**Acetylene ( $C_2H_2$ )** or ethyne is a colourless gas composed of hydrogen and carbon with the formula  $C_2H_2$ . The gas has a boiling point of  $-84^\circ C$  and a melting point of  $-108^\circ C$ .

C It is odourless, the odour of the commercial gas being due to traces of hydrogen phosphide and hydrogen sulphide unavoidably introduced during the manufacturing process. Acetylene may be made by the direct combination of its constituent elements in the electric arc, but this method is only of scientific interest, and the gas is always manufactured by the interaction of calcium carbide and water. The calcium carbide is manufactured by heating together in the electric furnace lime and anthracite coal or coke. The product is not pure calcium carbide, and it is sold on the basis of the acetylene gas it yields. Acetylene is a highly inflammable gas, and is used as an illuminant and for welding, since the oxy-acetylene flame gives an extremely high temperature. Acetylene is also gaining ground as the raw material for a number of organic chemicals that can be produced from it by catalytic reactions, and is finding a use in medicine as an anæsthetic. For the latter purpose the gas is carefully freed from all impurities.

Although acetylene can be readily liquefied by the application of cold and pressure, it is not safe to transport it in the compressed or liquid state, owing to the liability of a spontaneous explosion. The method by which the gas is handled is to dissolve it in acetone, in which it is very soluble, even at atmospheric pressure, the solubility increasing with a rise of pressure. The usual pressure employed is one of 16 atmospheres, at which acetone dissolves nearly 100 times its original volume of acetylene, although the volume of the liquid increases by more than 50 per cent in so doing. As an additional precaution the cylinders containing the acetylene solution are packed with an absorbent material, such as kieselguhr or kapok fibre, the purpose of this being to restrict any explosion that may occur in the non-dissolved acetylene to the part of the cylinder in which it takes place.

When used as an illuminant acety-

lene has to be burnt in specially designed burners, since it consumes, for an equal volume, much more air than does coal-gas. Acetylene has a illuminating power approximately 1 times that of coal-gas.

By far the greatest use of acetylene however, is for welding, for which purpose dissolved acetylene is often employed in order to obtain the required pressure, the oxygen consumed also supplied from cylinders, where it is stored under pressure.

Acetylene Lighting, *see* LIGHTING ARTIFICIAL.

Acetyl-salicylic [Û-SE'-TIL-SALI-SILIK] Acid, the chemical name for *aspirin* (*qv*).

Achæa [AKÊ'-A], territorial division of the Peloponnesus, Greece, stretching along the S coast of the Gulf of Corinth between Elis and Argolis, centre of the currant-growing industry (pos. Agion and Patras). The area roughly corresponds to that of the ancient Achæa (in its restricted sense), home of the Achæan League (*qv*). The Achæans (*qv*), who came from Achæa in N Greece, occupied most of the Peloponnesus. In 146 B.C. the name of Achaia or Achæa was given to the Romans to their new province in S Greece. After the fall of Constantinople in 1204 a Latin principality was formed. In 1460 the district passed to the Turks.

Achæan League, confederation of twelve cities of Achæa (*qv*), which developed under Aratus of Sicyon at the end of the 3rd cent. B.C. into an important coalition, including cities in Argolis, Arcadia, and Ægina. The league was involved in wars with Macedon, Ætolia, and Sparta. Arcadian Philopoemen was its great leader. In 146 B.C. the federal troops, having attacked Sparta in alliance of Rome, were defeated at Corinth by Mummius, after which the league was dissolved and S Greece turned into a Roman province.

Achæans, one of the principal races of ancient Greece, whose origin is controversial. They are said to have

from an Achaean (gk) in S Thessaly to the Peloponnesus where they absorbed the Mycenaeans (see AEGEAN CIVILISATION) giving their name to the whole peninsula. They were conquered by the Dorians in the Dorian invasion (c 1100 B.C.) See also GREEK HISTORY

**Achelous** [AKELŌS] now *Aspropotamo* the longest Greek river (115 m) rising in Mount Pindus and flowing to the Ionian Sea. The silt washed down by its current has formed at its mouth the small group of the Echinades Islands.

**Achensee** [ACHENSÄ] lake in the Austrian Tyrol area over 9 sq m a celebrated beauty spot.

**Acheson Process**, see CARBON TECHNICAL FORMS OF

**Acheulean Culture** see STONE AGE

**Achievement**, any complete heraldic composition i.e. armorial bearings. See also HERALDRY

**Achillea** [AKIL ɛð] (bot) name of many species of perennial plants of which the common yarrow or milfoil (*Achillea millefolium*) is the wild type. Some have woolly or silvery foliage and white yellow or rose flowers. *A. ptarmica* (Sneezewort) is a native species the double varieties of which are garden favourites for cut flowers. For the rock garden *A. alpina*. *A. Kellersii* and *A. Portia* are very suitable. The plant takes its name from Achilles who is said to have learnt its virtues from Chiron the Centaur.

**Achilles** [ɔ KI lɛz] hero of the *Iliad* (Homer) the most courageous Greek leader in the Trojan War. He quarrelled with Agamemnon over the captive maiden Briseis. He avenged his friend Patroclus by slaying Hector the Trojan leader but was himself killed before Troy was captured.

**Achill Island** island off the W coast of Connaught (Irish Free State) belonging to co Mayo. It is part of a submerged mountain system continued on the mainland. The surface which is very rugged rises to over 2000 ft above sea level in Slieve Croaghann and Slievemore. Pop over 5000.

**Achimenes** [AKIME NEZ] (bot) genus of plants including many interesting species and many garden varieties. Although usually treated as stove plants the ordinary varieties may be grown under much cooler treatment than is usually recommended and they make more serviceable plants. They are increased from tubercles which arise at the base of the stem and may also be propagated from cuttings and raised from seed. These should be kept in dry soil through the winter and started in January or February. Achimenes are very effective as basket plants.

**Achromatic Lens**, see OPTICS

**Acid**, may be defined as a substance containing one or more hydrogen atoms which are replaceable by metals or radicals having metallic properties (such as ammonium) with the formation of a salt. A more modern view is that the acid is the donator of a proton or hydrogen nucleus.

Acids may be either inorganic (to which class the majority of the commonly known acids belong) or organic. Organic acids are all characterised by the possession of the carboxyl (COOH) group. See also CHEMISTRY

**Acid Chlorides** organic compounds in which the hydroxyl (OH) group of an organic acid has been replaced by chlorine. They are obtained by the action of phosphorus tri- (or penta-) chloride on the acid. Acid chlorides are extremely reactive substances and are considerably used in synthesis. They absorb moisture with vigour forming the corresponding organic acid and hydrochloric acid.

**Acid Dyes** see DYEING

**Acids, Fatty** The fatty acids are monobasic organic acids the greater number of which are straight-chain compounds although certain members contain branched chains and one group contains a ring system attached to a straight chain. The fatty acids are so called on account of their occurrence in the natural fat and oils but in addition to the naturally occurring compounds a great many of them

which do not occur in nature (as well as those that do) can be prepared synthetically

The lower fatty acids are liquids, and are soluble in water, but those with more than 10 carbon atoms are solids at ordinary temperatures, and are no longer water-soluble. They may, however, be dissolved in solvents such as alcohol, ether, etc.

It is of interest to note that with one or two doubtful exceptions all the fatty acids that are found in nature contain an even number of carbon atoms, the acids with an odd number of carbon atoms can only be prepared artificially. The fatty acids occur in nature combined with glycerine, as *glycerides* (*qv*) in fats and oils, and in combination with other alcohols as esters in waxes.

The following list gives the principal naturally occurring saturated and unsaturated fatty acids. They all contain the group - COOH, but in the list only the empirical formula appears.

#### Saturated Fatty Acids

Name	Formula
Formic	$\text{CH}_2\text{O}_2$
Acetic	$\text{C}_2\text{H}_4\text{O}_2$
Butyric	$\text{C}_4\text{H}_8\text{O}_2$
Caproic	$\text{C}_6\text{H}_{12}\text{O}_2$
Caprylic	$\text{C}_8\text{H}_{16}\text{O}_2$
Capric	$\text{C}_{10}\text{H}_{20}\text{O}_2$
Lauric	$\text{C}_{12}\text{H}_{24}\text{O}_2$
Myristic	$\text{C}_{14}\text{H}_{28}\text{O}_2$
Palmitic	$\text{C}_{16}\text{H}_{32}\text{O}_2$
Stearic	$\text{C}_{18}\text{H}_{36}\text{O}_2$
Arachidic	$\text{C}_{20}\text{H}_{40}\text{O}_2$
Behenic	$\text{C}_{22}\text{H}_{44}\text{O}_2$
Lignoceric	$\text{C}_{24}\text{H}_{48}\text{O}_2$
Cerotic	$\text{C}_{26}\text{H}_{52}\text{O}_2$

#### Unsaturated Fatty Acids

Name	Formula	No. of double bonds
Oleic	$\text{C}_{18}\text{H}_{34}\text{O}_2$	1
Gallic acid	$\text{C}_{15}\text{H}_{26}\text{O}_2$	1
Erucic	$\text{C}_{22}\text{H}_{42}\text{O}_2$	1
Linoleic	$\text{C}_{18}\text{H}_{34}\text{O}_2$	2
Lipoic	$\text{C}_{12}\text{H}_{22}\text{O}_2$	3
Cl-palmitoleic	$\text{C}_{16}\text{H}_{30}\text{O}_2$	4
Myristoleic	$\text{C}_{14}\text{H}_{26}\text{O}_2$	1 (hydroxy acid)
Hydromyristic	$\text{C}_{14}\text{H}_{26}\text{O}_2$	1 (cyclic acid)
Chloromyristic	$\text{C}_{14}\text{H}_{24}\text{O}_2$	1 (cyclic acid)

See also OILS, FATS, AND WAXES.

**Acetale** [ACHETALUM], Sicilian town on the site of the ancient Acis,

near the river of that name (*see* Acis). There are thermal springs which were known to the Romans. Pop 23,000.

**Acis** [Ā'SIS] (Gr. myth.), shepherd in love with Galatea, he was killed by his rival Polyphemus. His flowing blood was changed into the R. Acis (*see* ACIREALE).

**Acland, Sir Henry Wentworth** (1815-1900), Radcliffe Librarian, Oxford; played a large part in founding Oxford University Museum.

**Acne**, an irruption of pimples, confined to the face, shoulders, back, and chest.

The condition is usually an infection of the grease, or sebaceous, glands of the skin by certain micro-organisms. This gives rise to an altered composition of the sebum or skin grease. The condition usually comes on at about the time of puberty, and is predisposed by bad diet and lack of fresh air and sunshine, together with too infrequent ablution of the skin. By proper attention to these factors, a cure can often be effected. Bread, pastries, and fats should be cut down in the diet, and plenty of fresh vegetables included. The skin itself should be kept scrupulously clean by the use of a good toilet soap, and the application of astringent cleansing creams.

**Acolyte** [pron AK'-O-LIT], one of the minor orders in the Church of Rome, immediately below that of subdeacon. The duties of the acolyte are now generally carried out by a layman. He carries the lights and performs certain other duties in the celebration of the Mass.

**Aconcagua** [AKONKA'GWA]. (1) Province in the Chilean Andes, forming the hinterland of the port of Valparaíso which is its capital. The trans-Andine railway runs through the province. Pop 400,000. (2) Peak in the Chilean Andes, 21,000 ft high, said to be the loftiest in the American continents, an extinct volcano. (3) River, 200 m in length, which rises on Mount Aconcagua, and enters the Pacific Ocean.

**Aconitum** [A-TŌ-YŪ-TŪ], a genus of hardy herbaceous plants belong

ing to the family Ranunculaceae. Some species are very beautiful and will grow under the shade of trees and succeed well in any garden soil propagated from divisions or seeds. Under trees they produce in early spring a mass of green buttercup like leaves and yellow flowers. The monk's hood must be artificially pollinated since bees have learnt to obtain the honey by piercing the corolla and without passing the stamens or pistil which are adapted by their relative lengths for cross pollination. The monk's hood is one of the most poisonous English plants. The dried root is used in medicine as a sedative termed *Aconite* for the heart and nerves (see ALKALOIDS).

**Acorn** see OAK

**Acorn Shell**, popular name for *Balanus* a crustacean of the order Cirripedia sometimes known as the barnacle though this term is more correctly applied to another member of the same order *Lepas* the goose barnacle (q.v.). It is a common seashore animal encrusting rocks, piers, shells and also the bottoms of ships which have been long at sea. Some species attach themselves to whales and even bore into the skin. The adult *Balanus* is enclosed in a shell of movable valves with the opening at the top and this shell is cemented directly to the rock whereas in the true barnacles there is a stalk of attachment. In the larval state *Balanus* swims freely developing a sucker which adheres to convenient objects.

**Acorus** [AKO-RUS] a genus of herbaceous plants with sword-shaped leaves striped green white red and yellow. *Acorus calamus* (Sweet Sedge) is a useful medicinal plant and a native of English marshes but is now used chiefly by perfumers for the fragrance of its roots.

**Acoustics** [AK OOSTIKS] see SOUND

**Aqui** [AK KWE] town 30 m. N. of Genoa, Italy in the Piedmontese province of Alessandria. The cathedral is a fine specimen of Italian Gothic. There are sulphur baths

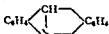
which have been known since Roman times. Pop. c. 15,000.

**Acquittal**, in law the discharge of an accused person after he has been properly indicted.

**Acquittance** (law) a written discharge for a sum of money due. It is binding on the person giving it except in cases of fraud or mistake.

**Acre**, port on the bay of the same name under the shadow of Mt. Carmel in Palestine. Acre is now of little commercial importance but from the days when the Hebrews were fighting for the Promised Land until the Crusades it had a distinguished history. A fortress on the coast road (the main route N. and S. through Palestine) and the terminal port of the caravan routes from Damascus and Palmyra, Acre was the key to Central Syria. It is mentioned in the Old Testament and in the works of Josephus. It was the port of entry for those crusading hosts which travelled by sea. It was captured in the first crusade (1104) lost in the second and recaptured (1191) in the third with the help of Richard Cœur de Lion after a two years' siege (see CRUSADES). It was besieged by Napoleon in his Syrian campaign and successfully defended by Sir Sidney Smith and the Turks destroyed by the British and Turks in 1840 and taken by General Allenby in 1918. It is still of some strategic importance being close to the boundary between Palestine and the French mandated territory in Syria. Pop. c. 6000.

**Acridine** [AKRIDEEN] a nitrogen containing organic chemical compound found in impure anthracene derived from coal tar. It can also be prepared synthetically. It has a melting point of 111°C. and its formula is

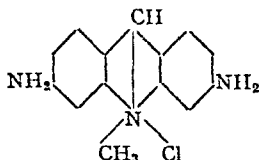


Acridine is of industrial importance as the parent substance of numerous dye-



stuffs It is a powerful sternutating agent

**Acridlavine** [AKRIFIĀ'VIN'] is one of the coal-tar dyes It is manufactured from acridine (*qv*) Acridlavine has the formula



and is used to a considerable extent as an antiseptic It is applied in very weak dilutions, of the order of  $\frac{1}{100}$  of 1 per cent It suffers from the disadvantage of high cost

**Acrolein**, or *acrylic aldehyde*, is an organic compound with the formula  $\text{CH}_2\text{CHCHO}$  It is a colourless inflammable liquid, having a boiling-point of  $52^\circ\text{C}$  It has a choking odour, affects the eyes, and is poisonous It is obtained by the oxidation of glycerol, and is used in organic synthesis It is the substance responsible for the odour of burning fat

**Acropolis**, name given to the upper part of the town in many cities of ancient Greece, usually the primitive settlement, perhaps originally a stockade on the most inaccessible ground in the vicinity In early times it formed the citadel and administrative centre of the town The Acropolis of Athens (*qv*) is the most famous, its buildings include the Parthenon, Propylaea, and Erechtheum

**Acrostic**, in the simplest form, a poem in which the first, last, or some other agreed letters of each line, or a combination of two or more of these, make a word or sentence when read successively Examples may be found in the poems of E A Poe, and it was very popular in ancient Greek and Hebrew literature (some of the Psalms are acrostics) In modern practice, the term is used for a sort of rhymed puzzle in which a series of initial and final letters must first be guessed, and then the individual words beginning

and ending with such letters The following is a very simple example of the modern Double Acrostic

*Uprights*

Lover's meat  
And lover's seat

*Clues*

- 1 The tempest may begin once more  
Meanwhile may I induce a snore?
- 2 A glittering jewel of the crown  
Not to be seen in London town.
- 3 All right in apples, though not food  
But, found in poultry, not so good

*Solution*

L ul L  
 I ndl A  
 P i P

Act, *see* PARLIAMENT.

**Acta Diurna**, the name given to a sort of news-bulletin posted up in public places in ancient Rome The practice was originated by Julius Caesar, and continued until the centre of the empire was transferred to Constantinople

**Actæon** [AK-TE'-ON], Greek mythical hero who, while hunting with his dogs, saw Diana bathing He was immediately changed by her into a stag, and chased and killed by his own hounds

**Acta Sanctorum**, the title of a work begun in 1643 by the Jesuit, John van Bolland, a chronicle of the lives of the saints and martyrs of the Catholic Church It has been continued since Bolland's death by a committee of Belgian Jesuits known as the *Bollandists*

**Actinic Rays**, the chemically active rays of light, an obsolete term, since chemical action is now known to be exhibited by light of all colours, also infra-red and ultra-violet *See also* PHOTOCHEMISTRY

**Actinium** [AK-TI'-N-YŪM] For the characteristics of Actinium see the article ELEMENTS Actinium is an extremely rare element that occurs in uranium ores It is of great theoretical interest on account of its radioactivity but it has no practical utilisation, and has so far only been obtained in minute quantities Chemically it resembles

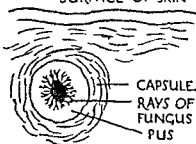
the metals of the rare earth group (See also RADIOACTIVITY)

**Actinometer** an instrument for measuring the chemical or photo chemical effects of radiation. A description of various types of actinometer will be found under the headings PHOTO-ELECTRIC CELL PHOTOGRAPHY (EXPOSURE METER) X RAYS

**Actinomycosis** [AK TĪ NO MĪ KŌ sis] an infective disease which begins and develops slowly. It is due to the presence and multiplication in the tissues of a plant known as the ray fungus. On account of its shape and mode of growth this fungus belongs to the class of fungi called *streptothrix*. Its morphological relationship with the bacilli which cause tuberculosis and leprosy and the spirochaete which causes syphilis are shown in the diagram. The bacilli are true bacteria the spirochaete is not in fact there is much difference of opinion as to how the spirochaete should be classified. None of these organisms forms spores but for the

any way identical nor can they be cured by similar methods. This group of diseases is known collectively as the infective granulomata they are characterised by the formation of a

### SURFACE OF SKIN

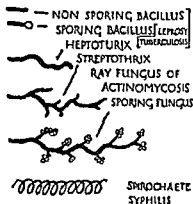


Granuloma of Actinomycosis.

nodule or granuloma the result of overgrowth of the tissues in response to irritation by the infecting organism. The granuloma exhibits a tendency to break down and produce an abscess or ulcer.

Actinomycosis itself occurs both in man and cattle. There is no evidence of direct infection from the flesh of diseased animals but since the fungus occurs widely distributed in grain it probably gains direct entrance through the mouth, lungs or alimentary canal. The fungus is unable to grow in the presence of oxygen and but for this factor it would probably be a more common disease than it is. It frequently occurs in the jaw nearly always following the extraction of a decayed tooth. This fact suggests that it is commonly present in the mouth long before teeth are pulled out but cannot gain access to the tissues until an open wound has been presented. It occurs also in the tongue, the lungs and the alimentary tract where it especially favours the appendix. It may also occur in the liver.

The granuloma which develops at the site of infection consists of a spongy-work of fungoid filaments with a number of radiating processes at the



A. actinomycosis.

for sake of further comparison a sporing bacillus is shown as well as a sporing fungus.

The four diseases have many points in common although they are not in

periphery, which give the appearance of rays, whence the name. These rays are surrounded by a thick capsule formed from the body tissues, but between the rays and the lining of the capsule there is a large quantity of pus. When this pus escapes, as it does sooner or later on account of the breakdown of the capsule and surrounding tissues, it is seen to contain a large number of opaque sulphur-like granules, which under the microscope are found to consist of small portions of the fungus. In this way the disease is diagnosed. Very many cases, however, are not diagnosed, or are diagnosed only after death. It should therefore be a rigid rule always to examine pus originating from an unexplained source with a view to finding these sulphur granules. In this way surgical interference may bring to a timely end a condition which would otherwise spread without ceasing.

**Action (law)**, a civil proceeding, commenced by writ, whereby a person injured seeks legal redress for his wrong.

**Actium**, old name for a promontory in Greece, on the Gulf of Arta, the scene of the decisive naval victory of Octavian over Mark Antony and Cleopatra in 31 B.C.

**Act of Parliament**, see LEGISLATION.

**Act of Settlement**, passed 1701, regulated the succession to the throne of Great Britain and Ireland. As Queen Anne left no surviving children the question of succession to the throne was an important one, the more so as the exiled Stuarts had many supporters. The Act settled that the heir to the throne was to be Sophia, a granddaughter of James I and wife of the Elector of Hanover, and her children, if Protestants. The Act also laid down that the rulers of England must be Protestant members of the Church of England, and dealt with certain other constitutional matters.

**Acton**, munic bor in Middlesex, now a W. suburb of London, a considerable factory development (largely motor and engineering works) has

taken place since the War, and the population (70,500 in 1931) is rapidly increasing.

**Acton, John Emerich Edward Dalberg, 1st Bn.** (1834-1902), English historian and leader of the Liberal Party among English Roman Catholics. Became Regius Professor of Modern History at Cambridge (1895) and published many historical works. Acton was also responsible for the plan of the *Cambridge Modern History*.

**Acts of the Apostles**, a book in the New Testament, continuing the narrative of the Gospels, and giving an account of the missionary journeys of the Apostles Peter and Paul. It is believed to have been written by St. Luke, the supposed author of the third Gospel. Internal evidence supports this view. St. Luke was a physician and both books show knowledge of medical terms.

**Actuary**, the expert employed by an insurance company whose business is to prepare tables showing the average expectation of life. The premiums charged by insurance companies on policies covering the lives of clients of different ages are based on these tables. See also INSURANCE.

**Adabazar**, large town in Anatolia, about 40 m. E.N.E. from the head of the Gulf of Ismid, on the caravan route from Constantinople eastward through Scutari. It has a considerable textile industry (silk and linen), and is situated on a branch of the Anatolian Railway. Pop. 83,000.

**Adalia**, seaport in S. Anatolia, on the gulf of the same name. In the Middle Ages it was the chief S. port of Asia Minor, but its importance is declining. Pop. c. 38,500.

**Adam**, the first man in the Biblical story. There are two accounts of his creation (Gen. 1-ii. 3 and from Gen. ii. 4 on). These may have been meant as either history or allegory, but are in no way scientific. The Biblical chronology places Adam's creation at about 4000 B.C., but man is now known to have existed for at least 100,000 years.

**Adam, Robert (1728-1792)** and **James (d 1794)** English architects both at different times architects to the king. Designed the Adelphi the Admiralty Office screen Mansfield House at Ken Wood Hampstead Lansdowne House London and part of Edinburgh University.

**Adamawa**, inland district of W Africa N.N.E. of the Iamerrus and of Lake Chad watered by the River Benue a tributary of the Niger. The district is fertile and populous. The Germans were the chief of its early European explorers the administration is now shared between France and Britain. Cotton is grown and ivory and ground nuts exported.

**Adam of Bremen**, see ADALBERT  
**Adam's Bridge** a series of sandbanks over a coral reef between Palk Strait and the Gulf of Manaar N.W. of Ceylon. The barrier which is 30 m long and only partially submerged is a complete hindrance to navigation (railway projected). It is supposed that at one time the bridge afforded a highway from Ceylon to the main land and Hindu legend represents it as the product of the architectural genius of their epic hero Rama.

**Adams, John (1735-1806)** 2nd President of USA (1797-1801). As representative for Massachusetts in Congress (1774) he helped to frame the Declaration of Independence (1776). Was Ambassador to Great Britain (1783).

**Adams, John, alias Alexander Smith (1607-1820)** English seaman who after taking part in the mutiny on board *HMS Bounty* (1789) sailed the ship to Pitcairn Island where he founded a settlement.

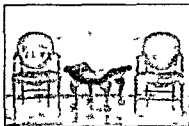
**Adams, John Couch (1819-1892)** astronomer and with Leverrier discoverer of the planet Neptune (1846). Professor of Astronomy at Cambridge (1860) where Adams prize was founded in 1818 by the fellows of St John's in honour of his discovery.

**Adams Peak** a conical granite mountain in S.E. Central Ceylon

rises abruptly to a height of 7300 ft above sea level. The name has been given to it on account of a depression in the crest shaped somewhat like a human foot. Mohammedan mythology represents this as the footprint of Adam and Buddhist mythology as that of the Buddha.

**Adams Samuel (1722-1803)** the American Cato worked all his life for American Independence and signed the Declaration (1776). He was Governor of Massachusetts (1794-9).

**Adam Style**, style of architecture interior decoration and furniture (qqv) named after Robert Adam (1728-1792) and his brother James. Historically the style belongs to the later Renaissance or Baroque but Robert Adam having been greatly



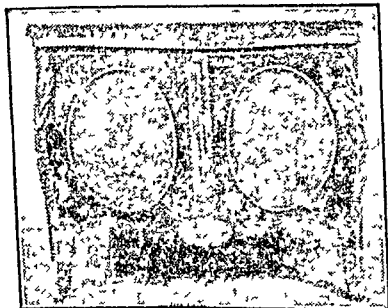
Adam Style 3 seater Arm chairs with Chippendale seat.

impressed by a study of Roman antiquities especially the Palace of Diocletian at Spalato introduced classical models which he adapted to English needs in such a way as to form a new style. He regarded a house as a homogeneous entity and held that the architect's duty extended to interior decoration and furniture.

The style is characterized by flowing lines and by an extensive use of stucco ornament in which constantly recurring motifs are paterae, fans, wreaths, honeysuckle and draped classical figures. In furniture carving hitherto supreme as an ornament, gives way to inlay and painting. The decoration is however kept in its

place as subordinate to beauty of form Adam ceilings, doors, and mantelpieces were especially successful. The designs are still copied.

The greatest architectural achievement of the Adam brothers is the



Adam Style Commode

Adelphi, in London, a series of streets and houses, now in danger of demolition, modelled on the Palace of Diocletian and named from the Greek ἀδελφοί "brothers". The furniture, which bears some resemblance to Hepplewhite and Sheraton, is strong, light, and elegant. Favourite woods are mahogany, satinwood, and amboyna, the inlays of rare exotic woods and painted panels, some of which have been ascribed to Angelica Kauffmann. The great disadvantage of this painted, as opposed to carved, furniture is its impermanence.

**Adams, William (1575-1620)**, English explorer and sailor. Most of his life was spent in the East, and he is noted for having penetrated into Japan. His knowledge of navigation was useful to the Japanese, and he remained in that country until his death.

**Adana**, a town about 30 m N of the Gulf of Alexandretta, in SE Anatolia, and the capital of a vilayet of the same name, corresponding to the Roman province of Cilicia. Adana is still a handsome city and the centre of a considerable trade in the productions of the province—cotton, fruit, cereals. Pop. of the town uncertain, but

probably between 70,000 and 100,000, of province, 230,000.

**Adaptation**, biologically, is the modification of an organism enabling it to live in equilibrium with its environment. Free-swimming fishes, for example, are adapted to an aquatic environment by their stream-lined shape, slippery bodies, gills, fins, and the absence of eyelids. Protective coloration aids fishes to escape detection by enemies and by prey. A man taking an intelligent part in a conversation shows mental adaptation to his environment. Adaptation may thus be a modification of form, structure, colour, and behaviour.

Somatic changes, and the immediate behaviour of an organism, may be of value solely to the individual. It is almost generally accepted that such modifications are not transmitted. Changes affecting the constitution of the actual germ cells cause heritable changes in the individual and affect the descendants. If such changes help the species to survive more successfully they are adaptive and of importance in evolution (*qv*). (See also ACCLIMATISATION, HEREDITY, CELL AND GENETICS.)

**Adda**, river in Lombardy, Italy, rising near the Stelvio Pass, in the Rhætian Alps, and flowing W through the Valtellina and then S, draining Lake Como, which it leaves at the S. extremity, continuing its course southward past Lodi to join the River Po. Length, c 150 m.

**Adder**, or *viper*, the only venomous snake in Great Britain, is frequently confused with the harmless grass



Adder

snake, but is usually readily distinguishable by a black zigzag line down the back and by the absence of t

**Adder's**

yellow collar. It lives in long grass and undergrowth emerging into the open on sunny days and feeds on frogs, lizards, mice and other small animals. The adder's bite is seldom fatal to human beings. The young are born alive and the allegation that the adder swallows its young when danger threatens is unsubstantiated. The adder is European in distribution.

**Adder's Tongue** see **FERNS**

**Addis Ababa**, capital of Abyssinia (at) terminus of the only Abyssinian railway and centre of a local

**51****Address**

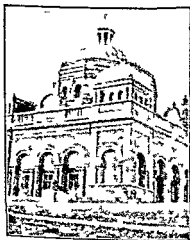
to write a poem on Plenheim. This *The Campaign* gained him several Government posts. He contributed to *Steel's Tailor* (1707-11) produced the *Spectator* (1711-12) and wrote for the *Guardian* (1713) edited by Steele. His most successful work the tragedy of *Cato* was acted in 1713. The *Spectator* was revived for a year after which Addison founded *The Freeholder* (1715-16). In 1716 he married the Countess of Warwick. While his plays are largely forgotten his reputation as an essayist stands high. He excelled in elegant prose and original humour and is considered as the founder of popular article writing.

**Addison's Disease** a vast disease associated with a bronze discoloration of the skin due to a disorder of the capsular part of the suprarenal glands in which there is a disturbance of the formation of the hormone *adrenalin* (q.v.).

Besides weakness and bronzing of the skin additional symptoms include gastric upsets involving vomiting and disturbances of the bowel either constipation or else severe diarrhoea. There are also disturbances of the heart with severe palpitations and occasionally the patient enters into a state of extreme nervousness. The course of the disease is prolonged and progressive lasting years and finally proving fatal. The usual cause is tubercular disease of the suprarenal glands but provided this disease does not spread to other parts of the body the patient's health may be maintained for long periods by the administration of *adrenalin*. See also **ENDOCRINE SYSTEM**.

**Addled Parliament** (1614) the second parliament of James I. It declined to grant supplies till the King had redressed grievances. He refused and the assembly which had not succeeded in passing a single Bill, was dissolved.

**Address, Forms of.** The titles of those who bear them have a purpose and a use but it is very common to find them misused or over used. The correct use of the chief English titles



Addis Ababa St. George's Church

periodic trade with a fluctuating population usually estimated at about 60,000. By the Treaty of Addis Ababa May 1902 between Great Britain and Abyssinia the frontier of the Sudan was settled and certain trading and railway rights were given to Great Britain.

**Addison, Joseph** (1661-1719) essayist, poet and statesman. Dryden noticed his Latin poems in 1693 and through Lord Somers he was granted a pension of £300 in 1699. He became a member of the Kitcat Club and in 1704 was commissioned

in (i) addressing envelopes, (ii) starting a letter, and (iii) in conversation with their bearers, is as follows

*The Sovereign* (i) To His (Her) Majesty the King (Queen), (ii) Sir (Madam), (iii) Your Majesty

*The Prince of Wales* (i) To His Royal Highness the Prince of Wales, (ii) Sir, (iii) Your Royal Highness

*Duke or Duchess* (i) To His (Her) Grace the Duke (Duchess) of —, (ii) My Lord Duke (Madam), (iii) Your Grace

*Marquess* (i) To the Most Honourable the Marquess of —, (ii) My Lord Marquess, (iii) Your Lordship

*Earl, Viscount, Baron* (i) To the Right Honourable the (Earl of) —, (ii) My Lord, (iii) Your Lordship

*Baronet and Knight* (i) To Sir (Thomas) — (Bt), (ii) Sir, (iii) Sir (Thomas)

*Archbishop* (i) To His Grace the Lord Archbishop of —, (ii) Your Grace or My Lord Archbishop, (iii) Your Grace

*Bishop* (i) To the Right Reverend —, (ii) My Lord Bishop, (iii) Your Lordship

*Dean* (i) To the Very Reverend the Dean of —, (ii) Very Rev Sir, (iii) Mr Dean

*Archdeacon* (i) To the Venerable the Archdeacon of —, (ii) Venerable Sir, (iii) Mr Archdeacon

*Clergymen* should never have the title Reverend prefixed directly to the surname, the Christian name or initials must come between

*The Lord Chancellor* (i) To the Right Honourable the Lord High Chancellor, (ii) My Lord, (iii) Your Lordship

*Vice-Chancellor* (i) To the Honourable —, Vice-Chancellor, (ii) and (iii) Sir

*Puisne Judges* (i) To the Honourable Mr Justice —, (ii) and (iii) Sir (My Lord when on the Bench)

*County Court Judges* (i) To His Honour Judge —, (ii) and (iii) Sir (Your Honour when on the Bench)

*Justices of the Peace* are addressed as Your Worship when on the Bench

*Lord Mayor* (i) The [if of London or York Rt Hon the] Lord Mayor of —; (ii) My Lord, (iii) Your Lordship

*Mayor* (i) The Mayor of —, or (on formal occasions) To his Worship the Mayor of —, (ii) and (iii) Sir (Your Worship when in Court)

Naval or military rank takes precedence of any other title borne by its holder. Ambassadors and their wives take the title "Excellency." Privy Councillors (but not their wives) are "Right Honourable." Cardinals have the title "Eminence." See also

#### TITLES AND COURTESY TITLES

"Address, The," the resolution moved by the two Houses of Parliament thanking the King for his speech at the opening of the parliamentary session. The resolution is moved by two Government supporters and forms the subject of a general debate. Amendments may be moved, and a defeat of the Government on this occasion is regarded as a vote of no confidence

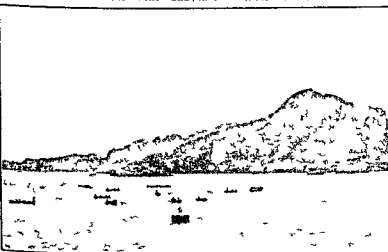
Adelaide, capital of the state of S Australia, situated near the Torrens R., on the coast of the Gulf of St Vincent, an inlet at the E extremity of the Australian Bight. The town was founded in 1836, designed in rectangular form, and named after the consort of William IV, the University, two cathedrals (Anglican and RC) and the School of Mines are among the principal buildings. Adelaide is the outlet of the Murray R. district, and a railway centre. A harbour was cleared by dredging a deep inlet north of the city, and it has since been supplemented by the construction of an outer harbour to accommodate ocean-going traffic, the harbour district is connected by rail with Port Adelaide

Adelaide is separated by the Mount Lofty range from the Murray R. district, a railway crosses a col in the hills, and is the principal artery of trade in this part of Australia. Adelaide enjoys a very fine climate of the Mediterranean type, with a fairly heavy winter rainfall. The neigh-

ouring soil is a fertile alluvium  
ereals (especially wheat) and fruit are  
largely cultivated the vine is grown  
and there is an increasing production  
of wines of various types Staple  
exports are wool wheat wine and

presumed that such a transfer unless  
it is a portion (qv) was intended to  
adeem we take the place of the  
legacy either completely or in part

Aden town and British protectorate  
in S W Arabia about 100 m E of the



Aden.

fruit Top 1931 (with suburbs)  
3.4 337

Adelaide Queen (1792-1849) wife of  
William Duke of Clarence (1818) who  
became King William IV of England  
in 1830

Adeler Max (Charles Heber Cla h)  
(1841-1915) American humorist  
Wrote among other works *Out of the  
Hurry Burly* (1874) and *A Bad  
Boy's Diary*

Adelphi, a district of London between  
the Victoria Embankment and the  
Strand consisting of arches and super-  
imposed terraces the work of Robert  
and James Adam (qv) Many cele-  
brated artists and writers have lived  
in the handsome houses of the Adelphi.

Ademption (law) a transfer of  
property which operates in law as a  
complete or *pro tanto* substitution for a  
gift previously made by the donor's  
will and unrevoked at his death. It is

straits of Bab-el Mandeb It is admin-  
istered as a province of India. The town  
is situated on a bleak waterless penin-  
sula of volcanic rock it is a very  
important strateg point coaling  
station and cable junction The neigh-  
bouring hinterland with the island of  
Perim and Socotra form a British  
Protectorate with an area of 40 000  
sq m and a pop of 49 000

Adenandra Fragrans, a beautiful  
shrub from the Cape renowned for its  
fragrance and adaptability to green-  
house culture This May flowering  
bush 2 ft high requires a compost of  
peat loam and sand. Rose-coloured  
blossoms. Requires careful watering

Adenanthera, E Indian trees and  
shrubs with white or yellow flowers.  
*Adenanthera paronina* yields the san-  
dalwood of commerce

Adenoids, see NOSE LAR AND  
THROAT



*Adenophora* (*Gland Bellflower*), a group of blue-flowered hardy perennial species, of which *Adenophora Potanini* is most grown in gardens, easily raised from seeds. All are easily grown in sandy soil.

**Adhesives**, substances used to cause two surfaces to adhere together. Their effectiveness is determined, firstly, by their own mechanical strength when set, and secondly, by the tenacity with which they adhere to the substances which they are intended to join. They are also frequently required to withstand heat and moisture. No known material fulfils all requirements ideally, it is found necessary in practice to make use of a great variety of substances. Of these, few have such good qualities as properly prepared glue, which is capable of joining wood and all softer substances so firmly that the joint is stronger than the material itself. By the addition of acetic acid and other substances glue may be prevented from gelatinising, thus forming the basis of the adhesives sold in collapsible tubes. Glue can be made waterproof by adding to it about 2 per cent of potassium bichromate. In order to prevent its drying to extreme brittleness glycerine may be added, this may be combined with the use of alcohol instead of water to dissolve the glue. Isinglass dissolved in alcohol and also in strong acetic acid can be used for repairing small articles of all kinds, especially such as cannot be subjected to heat. Polished surfaces should be roughened before using any kind of cement.

What is called marine glue consists of various mixtures of rubber with shellac and asphaltum or pitch, they soften with a gentle heat, and are waterproof. They are exceedingly useful for temporarily cementing objects, as in the grinding of glass and such-like operations. The use of cellulose acetate and other cellulose products, dissolved in solvents for adhesive purposes, is increasing, what is called plastic wood consists of finely ground wood mixed with a binder of

this kind. Its use supersedes very largely the older mixtures of wax and resin used for cementing such things as knives and tools into sockets.

There is a considerable variety of cements for mending broken earthenware, marble, glass, etc. One type consists of a mixture of an albuminous substance such as the case of milk, or white of egg, with quicklime. Another is silicate of soda or water glass mixed with lime, magnesia, or other oxides. A third type is made of a mixture of glycerine and litharge. All these cements depend upon chemical reaction for their setting, but the results obtained depend very much upon the way in which the ingredients are prepared and mixed. The litharge and glycerine is the most certain in its result, and is excellent wherever cement is required to fill cavities well as hold. In many cases shellac sealing wax, carefully applied and warmed by means of a fine gas jet, a strong and useful cement. Melted sulphur mixed with powdered glass an excellent insulating cement for electrical work, in earlier times it was regularly used to hold the terminals of electricity meters, but has been superseded by porcelain. A useful fireproof cement is made with fire-clay, sand, and the minimum amount of water glass; this is used for repairing stoves. Another useful cement of this character is made with iron filings or turnings mixed with sulphur and sal ammoniac and applied wet.

Dental cements, which are obtained ready for mixing, represent the high perfection obtainable in the art, but they are expensive, and very disappointing if not handled expertly.

*Adiantum*, or *Maidenhair Fern*, favourite fern for cottage windows where beautiful specimens are often seen. It is not a good fern for town where the soot and other impurities in the air soon kill it off. It requires some lime, and is found wild in places in the W of England and Ireland, usually in almost inaccessible

cliffs or in the rough stone face of  
deserted slate quarries

**Adige** [A dʒi ʒi] N Italian river  
(the second longest in Italy) which  
rises near the Brenner Pass in the  
Rhaetian Alps and flows S to the  
plain of Lombardy and hence SE  
past Verona and Legnano to enter the  
delta of the Po. Although the river is  
partly navigable its current is very  
rapid especially in the Lombard Plain  
and it is subject to great variations in  
depth. Length over 700 m

**Adigeli**, district of Circassia (N  
Caucasus) an autonomous pastoral  
community of the USSR. The  
district is watered by the Kuban R.  
Pop. over 100 000

**Adipocere** literally fat wax a  
waxy material sometimes found on  
exhumed corpses. It is the product of  
decomposition of the body fats and  
consists of free fatty acids together  
with their lime salts. The presence of  
moisture in the burying ground in  
appreciable quantities is essential for  
its formation

**Adirondacks**, mountain group in the  
NE. of New York State, U.S.A.  
Geologically connected with the  
Laurentian system of very old rocks  
in Canada, geographically related to  
the Appalachian chain of which they  
are sometimes said to form a part.  
The Adirondacks are important as  
forming the watershed between the  
Hudson R. and the St. Lawrence  
Lakes Champlain and George are in  
the neighbourhood which is a popular  
holiday resort. Highest summits are  
over 6000 ft

**Adit**, *see* MINING

**Adjective**, *see* GRAMMAR

**Adjutant**, an officer who assists the  
commander of a battalion or similar  
unit in the British Army usually of the  
rank of captain or lieutenant. His  
duty is to transmit the orders of his  
commanding officer and superintend  
their administration

**Adjutant Bird**, *see* STORK

**Adler** Alfred, *see* INDIVIDUAL

**Psychology**

**Adler Hermann** (1879-1911) be-

came Chief Rabbi of the Jews of the  
British Empire in 1891. Wrote con-  
troversial works in defence of Judaism  
and the Pentateuch against the attacks  
of Max Müller and Bp Colenso

**Administration** (law) the manage-  
ment of the estate of a person who has  
died intestate or though leaving a  
will has no executors. In such a  
case the Probate Division of the High  
Court grants *Letters of Administration*  
to an administrator (*qv*). *See also*  
INTESTACY EXECUTOR

**Administrator** in law person ap-  
pointed by the Probate Division of the High Court  
to administer the estate of a deceased  
person in the absence of properly  
appointed executors. Letters of ad-  
ministration *is* the order vesting the  
property in the administrator. He  
generally granted to the next-of-kin  
in the case of a married woman, her  
husband has an absolute right to  
administer the estate. In certain  
cases limited administration is granted  
*e.g.* administration *durante minore*  
*etate is* during minority where an  
infant is entitled to the grant his  
guardian is appointed to act during the  
minority. Administration *pendente*  
*lite is* pending the settlement of some  
action in which the validity of the will  
is contested. Administration *cum*  
*testamento annexo is* with the will  
attached where no executor has been  
appointed though a will was made or  
where the executor refuses to act.  
The Registrars of County Courts may  
receive applications for letters of  
administration in certain cases where  
the estate does not exceed £100. *See*  
*also* DEVOLUTION

**Admiral**, a naval officer commanding  
a fleet or squadron, who may be an  
Admiral of the Fleet, Admiral Vice-  
Admiral, or Rear Admiral according  
to the importance of his command

**Admiralty** the British department of  
State which administers the Navy.  
Until 1546 all such duties were in the  
hands of a Lord High Admiral, whose  
personal authority gradually passed to  
an inefficient Navy Board, which was

reorganised in 1832 by Sir James Graham. Lack of co-operation between the supply and technical departments produced grave scandals and absence of central policy. An intelligence committee was formed in 1887, and in 1904 centralised authority was obtained by giving the senior naval lord power over his colleagues. A naval war staff was established in 1911 by Winston Churchill, but was not supported. In May 1917 the First Sea Lord was made chief of the naval staff, which was increased in size. He superintended naval strategy and the movement of ships, while the Second Sea Lord remained chief of personnel, the Third Sea Lord controlled technical and engineering matters, and the Fourth Sea Lord was in charge of supplies. The Board of Admiralty to-day consists of the First Lord, the four Sea Lords, the Deputy Chief of Naval Staff, the Assistant Chief of Naval Staff, the Parliamentary and Financial Secretary, the Civil Lord, and the Permanent Secretary. It administers an expenditure of about £50 millions annually and a force of almost 100,000 men.

**Admiralty Court**, a court whose function of trying maritime causes was formerly exercised by the Lord High Admiral, and has now been transferred to the Probate, Divorce, and Admiralty Division of the High Court. It may act as a Prize Court (*q.v.*), decide cases of salvage, actions for damages arising out of collision of ships, claims by seamen for wages, etc. Its criminal jurisdiction is now exercised by the Central Criminal Court, and matters affecting discipline in the Navy have been transferred to naval courts-martial.

**Admiralty Islands**, a group of islands in the Bismarck archipelago, N.E. of New Guinea, numbering about forty, of which Manus is the largest. Part of a German protectorate until 1914, they are now administered by Australia. There are pearl fisheries. Cannibalism still occurs among the natives, who are of Papuan race. Pop. c. 13,700.

**Adobe**, impure chalky clay, important in the sun-dried brick industry of the W. U.S.A.

**Adonis**, a Greek youth of great beauty, loved by Aphrodite, and protected by her in his infancy. He was killed by a boar while hunting. Adonis has been associated with the change of seasons from the fact that he spent a third of each year with Persephone in the underworld, a third with Aphrodite, and was allowed the other third to himself. See *Adonis*, *Atis*, *Osiris*, by Sir J. G. Frazer.

**Adonis (bot.)** (*Flowers of Adonis*, *Pheasant's Eye*, *Ox-Eye*), genus of plants of the crowfoot family. *Adonis vernalis* is a perennial spring-flowering plant of yellow colour, and *A. aestivahis* a crimson annual.

**Adoption**, in law, the voluntary reception of the child of other parents as one's own. This is a very common practice on the Continent, but in England was not recognised at law until the Adoption of Children Act, 1926, since when application may be made to the High Court, County Court, or Court of Summary Jurisdiction for an order authorising the applicant to adopt the infant in question. No order may be made where the applicant is (1) under 25, or (2) less than 21 years older than the infant, unless they are within the prohibited degrees of consanguinity, or (3) the sole applicant is a male and the infant a female, unless there are special circumstances justifying an order and in certain other cases. The consent of every parent or guardian of the infant must be obtained unless such person has abandoned the child: or cannot be found. In the case of married persons not separated, both spouses must consent to the adoption. The Court must be satisfied (a) that every person whose consent is necessary has consented, understanding the effects of the order, (b) that the order will be for the welfare of the infant and (c) that the applicant has not received or agreed to receive, and that no person has given or promised to





ARMOUR BACK PLATE OF GILT STEEL  
(Italian Second half of 16th century)

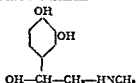
give to the applicant any payment or other reward except such as the Court may permit. The Court may impose terms and conditions upon the applicant. The effect of an order is that all the rights of the parent or guardian in relation to the child pass to the adopter who may exercise such rights as if the child had been born to him or her in lawful wedlock. But the adopted child does not lose any rights to property to which, but for the order it would have been entitled under an intestacy or a disposition nor does the order confer on the child any right to property as a child of the adopter.

**Adour** [AD-OR] river in SW France rising under the Pic du Midi de Bigorre in the Pyrenees and flowing in a wide semi-circle convex to the N through the plains of Tarbes and Landes to enter the Bay of Biscay through a sand-encumbered estuary very dangerous to navigation. Length over 200 m. The principal town on its banks is Tarbes.

**Adowa** (*Adwa*) town in Tigré province of Abyssinia, where the Italians suffered a severe defeat on March 1 1896.

**Adrenalin** [ADRENALIN] (*Epinephrin* *Suprarenin*) is a naturally occurring compound of very great physiological importance. It occurs in the mammalian body as a secretion of the suprarenal glands which are small ductless glands situated as their name indicates above the kidneys. Adrenalin is used in medicine to a very large extent its principal action being that of raising the blood pressure very considerably by constricting the arteries and increasing the rate of heart-beat. This action of constricting the arteries gives adrenalin value as a haemostatic (a substance which stops bleeding). For this latter purpose adrenalin is applied to the place affected; for raising the blood pressure generally it is given by injection. It is also of value in relieving asthma spasms. Adrenalin is a crystalline white powder having a melting point of about 203 C.

Chemically it is a derivative of catechol and it has the formula



**Adria**, more correctly **Atria** a town near the delta of the R Po of very ancient foundation being probably a settlement of the Veneti. It is now c 14 m. inland though it gives its name to the Adriatic Sea. Pop 19 900.

**Adrian**, name of six popes **ADRIAN** I pope from 772 to '95 Charlemagne helped him to rid his domain of the Lombards **ADRIAN** II pope from 807 to 872 **ADRIAN** III pope from 884 to 895. **ADRIAN** IV the only English pope (Nicholas Breakspear c 1100-1159) Deserted by his father he became a monk at St Albans and subsequently abbot of St Rufus near Arles. A cardinal archbishop in 1146 he was elected pope in 1154. During his papacy he was engaged in disputes with the Hohenstaufen dynasty **ADRIAN** V pope in 1176 **ADRIAN** VI pope from 1522 to 1523 His attempts to stop abuses aroused considerable opposition.

**Adrianople**, a large town 140 m WNW of Constantinople in European Turkey on the railway from Constantinople through the Balkans to Belgrade. It is an important trading centre manufactures silk and other textiles and is a mart for agricultural produce drugs and dyes. In 323 Constantine here defeated Licinius his fellow-emperor and the Visigoths under Fritigern won a great victory here over the Romans in A.D. 378 defeating and slaying the emperor Valens. It was the scene of operations during the Balkan Wars, 1912-13. The Treaty of Adrianople 1829 gave Russia control over the mouths of the Danube. Pop c 35 000.

**Adriatic Sea**, The, of the Mediterranean.



ARMOUR BACK PLATE OF GILT STEEL  
(Italian Second half of 16th century)

**Ad Valorem** ( according to the value ) a term used especially in connection with customs duties Imports may be taxed a fixed amount per ton or per cwt such a tax is called a specific duty or they may be taxed a fixed amount per unit of value which is an *ad valorem* tax and is expressed as a percentage Thus if the tax on cameras is 50 per cent *ad valorem* a camera valued at £ 0 would be taxed £10

**Advancement (law)** *see* PORTION

**Advent**, in the Christian calendar the season of preparation for the feast of Christmas lasting 4 weeks from the Sunday nearest to Nov 30 It was formerly a season of fasting and special devotion First observed in the W Church, it is kept all over the Christian world to-day

**Adventists** Second, an American religious body founded in the early part of the 19th cent who believe that the second coming of Christ will take place in the near future The Seventh Day Adventists who keep Saturday instead of Sunday as their weekly day of special devotion are a branch of this body

**Adventitious Roots (bot)** roots produced on leaves or stems. They serve the same purposes as normal roots absorbing water oxygen and food materials and attaching the plant to the soil or other substratum

**Adverb** *see* GRAMMAR

**Advertising** the process of spreading information about goods or services with the object of increasing the demand for them In various forms such as classical wall writing and medieval public crying it has existed from the earliest times The invention of printing in the 15th cent. however completely revolutionised its expression, though advertisers but slowly learned the possibilities of the printed word. Occasional advertising broad-sheets were issued as early as 1150 and the weekly papers of the mid 17th cent. frequently carried announcements of contemporary luxuries such as coffee tea, chocolate books medicines etc

Standardised goods lend themselves most effectively to sustained advertisement and large scale production combined with a system which encouraged violent commercial competition produced a phenomenal expansion of advertising after c 1850 Production is most economical when carried out on a large scale and for this a large market is necessary This can only be obtained by bringing the goods to the notice of the maximum number of people hence the wide and rapid spread of advertising

Newspaper advertising rapidly increased in importance with rising circulations among large new urban populations This was supplemented by bill posting and other forms of public display In the 20th cent advertising has developed into a huge and highly skilled business in which the estimated annual expenditure is about £150 millions in Great Britain and c \$1000 millions in the United States Newspapers and many other periodicals are now dependent on advertising for a large part of their main revenue Meanwhile other forms of advertising competed with but never rivalled this main field—electric sky signs wireless (in the USA and on the Continent) sky writing cinema film advertising, poster boardings shop window display circulars bills on buses tubes trams trains etc

Newspaper advertising is of two main types—small and display advertising the former largely personal, the latter commercial. Huge sums are expended in the purchase of space in the great national dailies, which as they enter almost every home in the country provide an unparalleled means of bringing to public notice new or improved products. The publication of net sale figures by newspapers affords the advertiser a valuable guide as to the extent of the public reached by such a announcement. Advertising rates are of course proportional to these figures and rise with them



from the Balkan peninsula. Its general direction is N W to S E along a distance of 450-500 m, with an average breadth of about 100 m. The exit into the Mediterranean through the Straits of Otranto is only about 45 m wide. The Dalmatian and Albanian coasts are mountainous and fringed with numerous islands, the E Italian coast and the Gulf of Venice are low, and formed of alluvium brought down by mountain torrents from the Alps and Apennines. The plain of Lombardy is a silted-up arm of the primordial Adriatic, and the silting process is still going on, ports which a few centuries ago were on the coast are now inland. The great limestone promontory of the Carso is the dividing feature between the two types of coast.

The chief modern ports are Venice, Trieste, and Fiume, all Italian. Ravenna, at one time the capital of the Western Empire, is of little modern importance.

**Adsorption (chem)** (or *absorption*) may be defined as the phenomenon whereby one body is taken up by another without chemical combination being effected and without liquid solution having occurred. Adsorption may really be said to be solution in which the solvent is a solid to whose surface the solute attaches itself. Typical examples are the adsorption of gases by activated charcoal and of hydrogen by heated palladium. (See also **COLLOIDS**)

**Adullamites**, a nickname given to a section of the Liberal party which opposed Gladstone's Reform Bill of 1866. The name had its origin in a speech by John Bright, who likened those who opposed the measure to the men who took refuge in the Cave of Adullam. (1 Sam xxii, 1-2)

**Adult Education**, the general term applied to classes taken by adults in their spare time. Facilities are available in most countries, and the curricula are very wide, covering anything from reading and writing to art and science classes. An offshoot is the arranging of tours in foreign

countries especially designed to enable people of similar tastes but different nationalities to meet. In England practically every public educational authority offers, at a very small cost, evening classes, the attendances at which are steadily increasing. The Workers' Educational Association conducts hundreds of classes, while many churches also arrange lectures or classes for their congregations. A further development is the practice of many big industrial firms, both in England and in the U.S.A., either to organise classes for skilled workers, or to provide the means for certain selected employees to receive advanced tuition in their particular trades at a technical school or college.

**Adulteration**, the act of adding some inferior substance to a commodity with a view to passing off the latter as pure. Such fraud is as old as commerce itself, and has called forth constant legislation. Under the various Sale of Food and Drugs Acts now in force it is an offence knowingly to sell any article of food or any drug which is not of the nature, substance, and quality demanded by the purchaser. But it is not an offence to add any ingredient not injurious to health, if required for the preparation of the material as an article of commerce, provided it is not added fraudulently to increase the weight or bulk or to conceal its inferior quality, if the article is labelled as mixed. Under the Margarine Act, 1887, all butter substitutes must be prominently labelled "margarine". (See also **FOODSTUFFS, PURITY OF**)

**Adultery**, sexual intercourse by a married person with any other than his or her spouse. In many countries it was and still is a criminal offence, but in England it is only cognisable by the courts of law as a ground for divorce. Adultery was also, however, a tort based on trespass and loss of consortium (*q.v.*), and though the action for criminal conversation (*q.v.*) has been abolished, an injured spouse may still petition for damages in the Divorce Court. (See also **MARRIAGE**)

scene of Rome's decisive naval victory in the first Punic War in 241 B.C. when C. Lutatius Catulus overcame Hannibal.

**Ægean Civilisation** general term for the Bronze Age civilisation in the region of the Ægean Sea (q.v.) known also as *Minoan* and *Mycenæan* its chief centres were Knossos in Crete and Mycenæ and Tiryns in the Argolid (N.E. Peloponnesus). At its fullest extent it covered the mainland of Greece as far N. as Thessaly the Ionian Islands the Cyclades Rhodes parts of Asia Minor including Troy (Hissarlik) Cyprus and Sicily. By extension the term may be said to include also the preceding Neolithic culture. In its architecture its art and its script it is distinct from any other civilisation.

**History of Discovery** Some of the architectural remains now known to belong to this period have been familiar for centuries. Thus Pausanias admires the Treasuries at Mycenæ and Orchomenos and tradition reflected in Homer and elsewhere threw out the strongest hints of the existence of a prehistoric civilisation. But it was not till the excavations of Schliemann at Hissarlik in 1873 and at Mycenæ in 1876 that the interest of archaeologists was seriously aroused. Such other evidence as had been forthcoming up to then had been misread and the objects dismissed as Phœnician or

Egyptian. When Schliemann excavated the Burnt City at Hissarlik he uncovered a hoard of gold silver bronze and pottery at Mycenæ the shaft graves yielded an incalculable wealth of objects of every description. Their style and fabric were so distinctive that it was at once realised that the world had met a strange civilisation. Since 1876 finds have multiplied. In Crete Sir A. J. Evans who has been at work almost continuously since 1893 has uncovered the Palace of Minos at Knossos. But the tale of excavations is not yet told. As late as 1906 the American school made important discoveries at Korakou a prehistoric port of Corinth. In 1931-2 the problem of

Ithaca was advanced by the British School a step farther towards solution.

**Chronology** The first duty of archaeologists once they had amassed and sorted out this wealth of evidence was to fit it into the general chronological scheme and to try to discover when this strange civilisation began and when it ended. Of all the classes of objects amenable to study the pottery appeared to be the most promising. Fortunately an enormous quantity of clay vessels of every shape and size and of every provenance was available so that it was possible to trace a continuous development from the earliest times to the latest. At Knossos Sir A. J. Evans recognised three distinct periods which he called Early Middle and Late Minoan. For purposes of easy reference each of these periods was subdivided into three. Approximate dates are

Early Minoan	3400-100 B.C.
Middle Minoan	100-1580 B.C.
Late Minoan	1580-1100 B.C.

Corresponding cultures in other parts of the Ægean area were Helladic or Mycæan on the mainland of Greece Cycladic in the Cyclades and Thessalian in Thessaly.

**Classification** There are obviously two main classes of evidence the fixed and the movable. In the first class came the prehistoric cities fortresses palaces houses tombs and examples of civil engineering. In the second the small objects discovered in the course of excavation. Among the most striking of the cities are Tiryns with its cyclopean walls Mycenæ with its Lion Gate in the Argolid and the island fortress of Gela in Lake Copais (Boeotia). The Palace of Minos at Knossos is perhaps the most interesting of the domestic buildings though Ægean palaces have been traced at Mycenæ Tiryns Thebes on the Acropolis of Athens and elsewhere. There are of two main types—the complex labyrinthine structure built round a central courtyard and the series of detached buildings with an isolated megaron or



hall (sometimes identified with the Homeric house) with separate apartments for men and women and no court. These palaces with their decorated columns, frescoes and mosaics and their ventilation windows and elaborate bathrooms and lavatories strike a distinctly modern note: some of them were on two floors.

The tombs were of various kinds, probably reflecting changes in burial customs (cremation appeared to be unknown). The most characteristic

restored entrance columns of the former may be seen at the British Museum.)

In many places traces of Ægean roads and bridges may be seen, but perhaps the most striking examples of civil engineering are concentrated on the dried up bed of Lake Copais in Boeotia. Remains of dikes and walls attributed to the mysterious Minyans are evidence of a determined effort on the part of prehistoric engineers to regulate the drainage of this marshy area.

But while due tribute must be paid



## Bull-leaping Fresco from Knossos

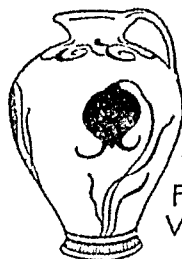
was the Tholos or beehive tomb, which was a circular vaulted chamber in the form of a beehive, approached by a Dromos or corridor and occasionally having a second inner chamber. The entrance to the tomb was sometimes flanked by a pair of columns decorated tapering downwards and supporting an enormous stone lintel. In one case the interior of the beehive was richly decorated. Some of these tombs were known to the ancients and were mistaken for treasure-chambers, the two finest being the Treasury of Atreus at Mycenæ and the Treasury of Minyas at Orchomenos. (The

to the architectural skill of the Ægeans it is the smaller movable objects that reveal the secrets of their civilisation and confirm the impression already made that it was quite distinct from any other. They include vases and vessels of every size, shape and purpose, objects of gold, silver, copper, bronze, ivory and bone, engraved gems, weapons and implements, bronze swords and daggers, often richly chased and inlaid, brooches, pins, razors, etc. All attest a high degree of artistic skill and individuality, which bears comparison with that of any other age.

# AEGEAN CIVILISATION



The lion  
and the Bull



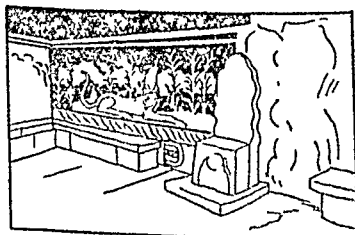
Water  
Flower  
Vase



Snake  
Goddess

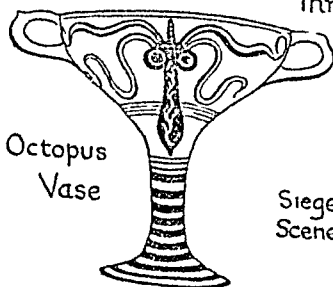
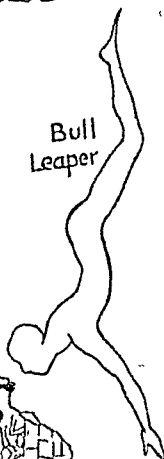


Dagger-Blade



Throne Room

Bull  
Leaper



Octopus  
Vase

Siege  
Scene



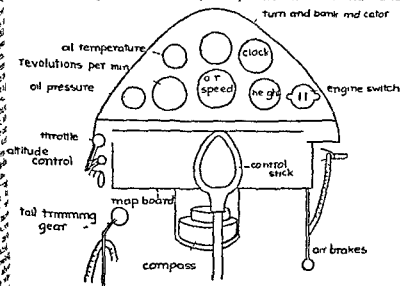
Culture Motifs displayed in Aegean Art.

subjected to much more violent motion in a plane than on a boat and hence is hardly satisfactory as a means for the helmsman to keep a steady course. This service is performed by an instrument called a turn indicator which instantly shows any deviation from a set course but not the compass direction of that course. See GYROSCOPE.

A very promising instrument is the earth inductor compass. This consists

this being indicated by a small revolving coil ammeter (see ELECTRIC MEASURING INSTRUMENTS). This current is opposite in direction according as the plane deviates to right or left and the needle of the instrument responds accordingly.

These methods are independent of signals from the ground which are possible only in the neighbourhood of aerodromes. But a very important development is the radio beacon which



Aerial Navigation Modern Instrument Board

essentially of a coil which is rotated at a constant speed and generates an electric current owing to the fact that it is cutting the earth's magnetic field. It is in fact a small dynamo the principles of which will be found described in the article ELECTRO-ACQUETIC INDUCTION. It has a commutator and brushes which are set in such a way that when the plane is on the desired course no current is generated when the plane deviates in either direction a current is produced,

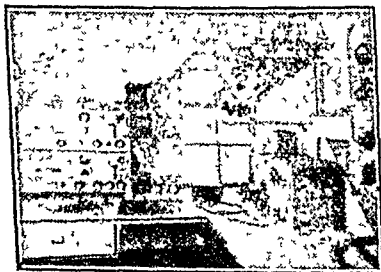
enables the airman to steer for a given point with great accuracy once he gets within its range. The principle of this is as follows: two radiating aeri-als are set at a considerable distance apart, and each is supplied with high frequency energy of the same strength modulated by two different low frequency oscillations of exact pitch. A wireless receiving set would thus pick up two different musical notes of equal strength from these beacons. These two stations are received on the

## Aerial

surface, and the direction and rate of his motion. Over the sea the position is determined by astronomical observations, by dead reckoning, and by signals received from beacons, landmarks wireless, etc. The navigator of the air is further concerned with the question of his height above the ground.

Position-finding by astronomical observations is naturally possible, but it is much less convenient for the airman when under way to carry out. See NAVIGATION.

What is called by the seaman dead reckoning is often called "blind flying" by the airman. Obviously if we



Aircraft Wireless Cabin

know our exact position at any starting-point, and our exact direction of motion and speed at all subsequent times we can plot our course on a chart, and thus calculate our position at any moment. Now, the seaman must know the currents and tides to which he is subjected, as well as the speed and direction of his ship through the water, but as a rule these currents and tides can be found with fair accuracy from a tide table and chart. But the airman is sailing in a medium in which the currents are much stronger and entirely unpredictable. He is able to tell the direction of his motion through the air by means of a compass in the same way as the seaman, and a similar instrument to the seaman's patent log will give him his speed through the air. But since the wind

quite commonly blows in any direction at a rate one-fifth (and generally much more) of his own speed, he may be hopelessly misinformed as to his direction and speed relatively to the earth, unless he knows exactly the speed and direction of the wind.

No method has yet been devised which an airman can tell the speed and direction of the wind while in the air unless he is able to distinguish clear objects on the ground. Even then he can only compare his own speed and direction through the air, as determined by the instruments to which he shall shortly refer, with the apparent motion of points on the ground seen through a telescope. By means of a simple sighting telescope he can tell the exact moment when he is over a given object, and if he knows the position of this object on the chart and can subsequently sight a second object, also on the chart, in a similar way, he can find his true direction and speed. Combining this result with his apparent direction and speed, he is able to deduce the direction and speed of the wind. This method is of use only in flying over territory every detail of which is known. Attempts have been made to construct instruments in which, by moving a prism or mirror in the telescope in the known speed, the effects of motion of the objects can be compensated. These mostly involve a knowledge of the airman of his height above the ground. The same is true where measures, by means of an instrument similar to a theodolite (*qv*), give an angular vertical bearing of an object at two instants of time. It is obvious that none of these methods is available over the sea unless shipping can be sighted, and so far no practicable method has been worked out, or even suggested, which dispenses with the knowledge of objects on the ground.

We next come to the means by which the airman determines his own direction. The first of these is the magnetic compass (*qv*), which in the damped form of the spirit compass has almost universal use. It is, how-

to guide the airman to the aerodrome and especially to aid him as far as possible in landing in very bad weather conditions such as fog. Strong visible light from neon lamps and also radio beams to be picked up by the airman (see AERIAL NAVIGATION) are provided while in addition a directing officer assisted by a wireless operator is installed in a high control tower and gets into touch with each machine as it approaches the aerodrome.

Few aerodromes have facilities for dealing with large airships. The method of mooring an airship apart from the use of sheds and hangars at present in use is to provide a fairly lofty tower or mooring mast furnished with a lift. The mast at the R.A.I. Works at Cardington is 200 ft high.

**Aerodynamics** the science of the behaviour of air and other gases when in motion. **HYDRODYNAMICS** ( $q v$ ) deals with the motion of water and other incompressible fluids whose treatment is simpler as the pressures set up by motion cause no change of volume in the fluid. For most practical purposes aerodynamics is concerned only with the manner in which the air is disturbed by the motion through it of or its motion past solid bodies. The object of the science is to determine the force exerted on a solid body and the energy dissipated by the motion making the latter first it is obvious that energy can be dissipated only in two ways firstly by friction between the surface of the body and the air and secondly by bodies of air being set in motion by the presence of the body the energy thus employed being dissipated as heat by internal friction. Theory and experiment show that turbulent flow of the fluid can be avoided and its "streamline" motion secured by shaping the body correctly. Nature has long ago developed stream-line shapes which can move rapidly through fluids without producing eddies all fast swimming fish have bodies so shaped.

Only the simplest cases can be

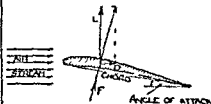
investigated mathematically for all purposes of practical design in aeronautics measurements on models are necessary. These are carried out in what are called *wind tunnels* large tubes in which a draught of air of any desired velocity and sufficient uniformity can be created by powerful fans. That at the National Physical Laboratory London is  $14 \times 7$  ft and is operated by 2 large fans taking 400 horse-power. Models of aeroplanes and airships can be hung in this tunnel and subjected to various air speeds their resistance lifting power and other properties can be observed with great accuracy by means of special instruments. Some of the results obtained are very surprising. The resistance offered by such things as circular wires and ropes can be greatly reduced by making them much thicker but suitably shaped in the direction of motion. Eddy formation mainly takes place behind the body and the general principle of streamlining consists in the avoidance of flatness in the after part of the body. A pointed forward part is of no great advantage in other words the tadpole's head is as good as the pike's.

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**Aero Engines**, see **INTERNAL COMBUSTION ENGINES**.

**Aerolite**, see **METEORITES**.

**Aeroplane** The aeroplane depends on the same principle as the kite



Aeroplane (Fig. 1).

namely that a current of air blowing against a flat or nearly flat surface slightly inclined upwards tends to lift



plane, but the low-frequency current, instead of being used to actuate a telephone, is made to set two reeds, tuned to the notes in question, vibrating. The principle is the same as that of the frequency indicator described in the article **ELECTRIC MEASURING INSTRUMENTS**. These two reeds will vibrate equally when the airman is equidistant from the two stations, and he is steering along the line which leads him to the middle point between the two stations, so long as he keeps the reeds in equal vibration.

The height of a plane above ground is determined in two ways. The first is by means of an aneroid barometer (*qv*) which indicates the height above sea-level if the level of the barometer at the time is known. It is of little value as a means of telling the height when near to the ground, even if the exact height of the latter above sea-level is known, since the height of the barometer may also vary. Great efforts are being made to develop apparatus based on the principle of the echosounder, which is now fully developed for marine work (see **SOUNDING**).

Speed relative to the air is determined by air-speed indicators based on the Venturi or Pitot principles (*qv*). These indicate the speed of the air past the plane by means of aneroid pressure gauges. Instruments based on the anemometer (*qv*) principle, and also upon that of the hot-wire gas meter (see **GAS METERS**) are also in use.

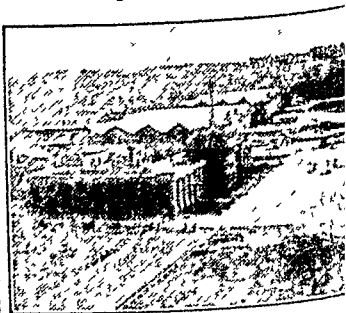
Modern development, which is directed mainly to the successful accomplishment of blind flying, is concentrated upon relieving the airman of as many functions as possible, by employing automatic control methods, the chief of which is automatic steering (see **AUTOMATIC CONTROL**).

One of the most serious problems is the deposition of ice, which may necessitate a forced landing, as well as completely upsetting navigational control. The ice is deposited from fog or rain upon the leading surfaces of the wings, struts, etc., and any attempt to combat it by artificial heat is useless. Experi-

ments are now being made to form these surfaces of soft rubber, and cause them to pulsate by air pressure when danger of ice is experienced.

**Aerial Roots** (bot.), root-like processes produced from the stem of a plant, e.g. ivy, by means of which it attaches itself to trees, rocks, and walls. The function of these roots is to support rather than to obtain food for the plant. Aerial roots are typical of plants in moist, warm climates, and of air-plants or epiphytes.

**Aerodrome**, airport, place at which aircraft can land safely, and find protection from weather and facilities for repair and overhaul. Present-day aircraft require a great deal of space



Croydon Aerodrome

for taking off and landing. In aerodromes cannot be constructed where reasonably flat surfaces are obtainable. They should allow at least 1000 clear yards run in any direction, while tall obstructions be avoided, such as trees, overhead cables, and so on, are a serious disadvantage. It is therefore impossible to construct aerodromes in the center of large towns. Thus, since the air traveler loses half an hour or more at each end of his journey in reaching and leaving the aerodrome, air travel for short distances is at present impracticable. The solution may be reached by the development of the autogiro (see **PROPLANE**).

Very important are the means

cannot be obtained. But in addition we have what are known as parasite drags that is to say the resistance offered to the air by such things as struts wires wind screens landing gear and so on. Nowadays these parts are streamlined as far as possible and the effect of this has been greatly to reduce though not to abolish the wind resistance due to them. Fig 3 shows how a strut or rod of circular section creates powerful eddies in the air whereas when it is streamlined these eddies are eliminated.

Present-day aeroplanes differ very greatly in design in spite of the fact that much theory and experiment has led to a very accurate understanding of the problem of construction. The principal difference is between the monoplane which has a single pair of wings and the biplane or multiplane which has a number of wings one above the other. The monoplane allows the

pilot unobstructed vision and it can be designed to afford a greater lift per unit area of wing. Some very large modern monoplanes have been built with wings thick enough to contain the engines. The monoplane is free from all struts and constructional parts producing parasite drag.

On the other hand bi and multiplanes are more stable structurally stronger for the same weight and have the advantage of requiring considerably less wing span.

The stability of an aeroplane is generally ensured by the use of what is called a tail plane. It will be seen that this in any form opposes the pitching of the plane. If it is set with a downward tilt so as to tend to depress the tail of the machine it opposes the natural tendency of the plane to nose dive and properly arranged a state of equilibrium is possible in which any deviation of the plane from the hori-

### MILITARY AIRCRAFT DISTINGUISHING MARKS



GREAT BRITAIN



USA



BELGIUM



FRANCE



GREECE



RUMANIA



SPAIN



FINLAND



DENMARK



HOLLAND

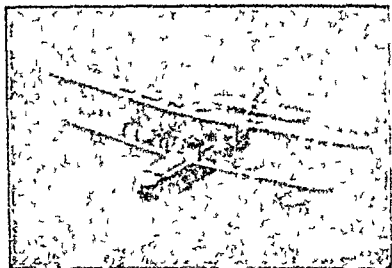


SWEDEN



CZECHOSLOVAKIA

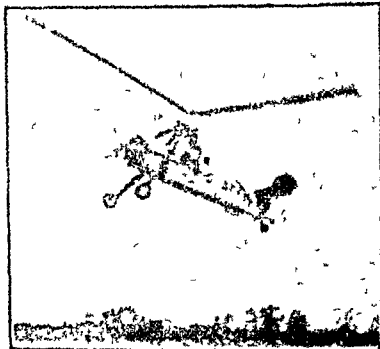
RED  YELLOW  BLUE 



"Scpio" Flying Boat

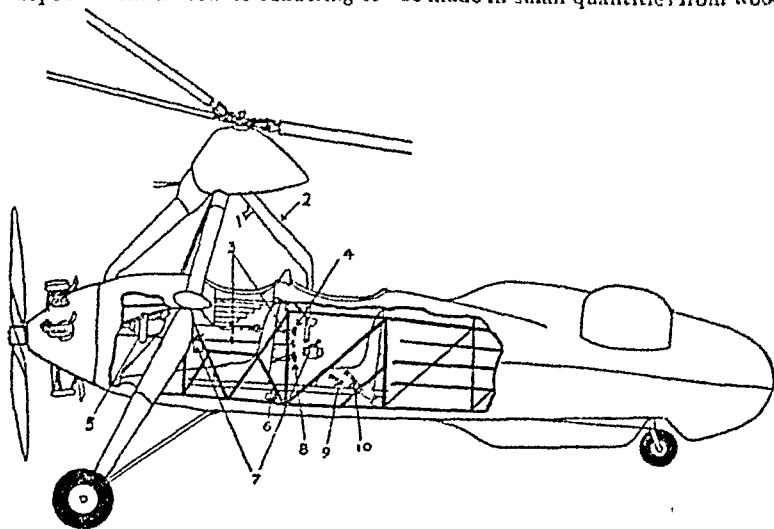
zontal tends to be corrected automatically.

The materials used in the construction of aeroplanes are still largely organic in origin. Originally wings and fuselage were made exclusively of wood covered with fabric, the fabric being "doped" with a view to rendering it



Autogiro

weatherproof. The great advantage of this arrangement is that the special and non-rectilinear shapes required in aeroplane work can much more easily be made in small quantities from wood



Autogiro, Sectional Diagram.

- |  |   |
|--|---|
| 1 Boss for mounting dual control lever           | 6 Rudder bar for steering tail wheel                  |
| 2 Inverted joy-stick                             | 7 Throttle control                                    |
| 3 Petrol tap                                     | 8 Lateral bias (adjustable at pilot's will)           |
| 4 Longitudinal bias (adjustable at pilot's will) | 9 Wheel brake lever (ground control only)             |
| 5 Clutch for starting rotor when on ground       | 10 Clutch and rotor brake lever (ground control only) |

## Æschines

and fabric than from metal but metal though liable to corrosion is more durable. All metal aeroplanes are not uncommon.

While the aeroplane is designed to land upon the ground being nearly always provided with wheels for this purpose a seaplane is designed to land on water and therefore has two or sometimes three pontoons. The development of seaplanes has been greatly advanced by the competition for the Schneider Trophy, and the illustration shows the latest British design. This illustrates the enormous relative size of the pontoons which are themselves designed aerodynamically and help the lift of the wings.

The flying boat is really an aeroplane in which the fuselage is seaworthy so that the machine can come down upon the water. The *Dornier DO X* flying boat is a familiar example of one of the world's largest aeroplanes carrying 100 passengers in addition to the crew, the wing span being 157 ft and the overall length 149 ft. The 12 engines develop 6000 horse power.

The autogiro is an entirely revolutionary machine which seems likely to play an important part in the future. In its latest form it is able to descend vertically and land without a run and to rise from the ground with a run of only 36 ft, climbing steeply away at 900 ft. per minute. The rotor—which takes the place of wings and as will be seen from the illustration is a windmill-like structure—is driven by power only in starting the machine, when under way it turns round by itself. The machine is now flown entirely by adjustment of the rotor and makes no use of any other steering device.

What is known as a *helicopter* is an ancient dream of inventors which has not yet been realised. The autogiro would now appear to have almost the ideal properties of a helicopter.

**Æschines** (349-314 B.C.) Athenian orator, a supporter of Philip of Macedonia and hence an opponent of Demosthenes (q.v.). His quarrel with Demosthenes culminated in the latter's

73

## Æsthetics

famous speech *On the Crown* and the withdrawal of Æschines from Athens.

**Æschylus** (525-456 B.C.) Greek tragic poet of Athens. His innovations in the number of actors and in staging gained him the name of 'The Father of Tragedy'. He was present at the battles of Marathon, Salamis and Plataea. Of the 90 plays attributed to him, only—*Persians*, *Oresteia*, *The Seven against Thebes*, *The Persians*, *Agamemnon*, the *Libation Bearers*, the *Eumenides* and the *Suppliants*—have come down to us. There are English versions of some of them by Gilbert Murray and Robert and E. B. Browning. He was the first tragedian to present two characters simultaneously on the stage, apart from the chorus.

**Æsculapius** (*Asklepios*) Greek god of medicine and healing, slain by Zeus in jealousy of his power over mortals. Æsculapius was the son of Apollo and the nymph Coronis. His symbol a snake curled round a staff has been adopted in the badge of the Royal Army Medical Corps.

**Æsop** (fl. c. 575 B.C.) author of the well-known fables. He is thought to have been a freed Phrygian slave and held an important position at the court of Croesus, King of Lydia. The fables have a very ancient origin and some may derive from Buddhist sources.

**Æsthetics** (from *Æsthesis*) may be defined as the science of art or of the beautiful, whether in nature or in art. In its literal sense as used by Kant it means the science of sense-perception as a source of knowledge without any reference to sensuous enjoyment. The restricted modern connotation of the word introduced by Baumgarten (see below *History*) confines it to the emotional activities of pure contemplation. These emotional activities involve pleasure, but pleasure of a peculiar sort. Æsthetic enjoyment is (or should be) independent of desire. Hence the pleasure experienced in the contemplation of a beautiful object has nothing in common with the pleasure of gratifying an appetite (of whatever

kind) This distinction immediately involves the subdivision of "higher" and "lower" pleasures, but any such arbitrary differentiation brings in its train many new difficulties where, for example, are we to draw the line? Æsthetic enjoyment, being thus superior to desire, is quite disinterested and utterly "useless" it is not concerned with practical considerations of value, greed, or vanity. But in everyday life human experience is not so simple as philosophers would have us believe. The man who is thrilled by the contemplation of a Rembrandt or a Turner may, and probably does, experience a complex of emotions and not a simple æsthetic feeling. He not only enjoys the beauty of the picture, but he may desire at the same time to possess it, because other people are collecting old masters, in order to gratify his sense of ownership, or with a view to making money by its resale. Nevertheless, æsthetic pleasure remains serene and unruffled.

Æsthetic enjoyment is sometimes said to be passive, in the sense that it involves no intellectual activity. We are said to be in a state of receptive inactivity while the beautiful sight or sound is impressed upon our senses. But this, quite apart from the metaphysical difficulties of such a theory, is obviously an overstatement. In order to obtain æsthetic enjoyment we must engage in a certain amount of intellectual activity ourselves, and in order to be intellectually active in the right way we must be trained artistically. It is sometimes an acute mental strain to listen to a great musical composition, even when its greatness is not in question. It is a still greater strain to have to listen to a musical composition about which there is any question.

It is, therefore, æsthetically the duty of everyone to develop his sense of the beautiful, in other words, to train his eye or his ear so that his emotional enjoyment may have full scope. We shall then get away from the attitude of the people who say, "I don't know

anything about art, but I know what I like."

*History of Æsthetics* Plato (c 427-c 347 B.C.), held absolute beauty, like absolute good and absolute truth, to be one of the ideal archetypes or ideas. Beauty exists in objects only so far as they approximate to the idea of beauty; they are helped in this approximation by love. A beautiful mind in a beautiful body is the highest example of beauty in the phenomenal world. Art is despised as mere imitation. Aristotle (384-322 B.C.) distinguished the beautiful from the good by saying that the good existed only in actions, but that the beautiful was found also in motionless objects. The pleasure it gave was independent both of desire and of utility. An object, in order to be beautiful, had to possess order, symmetry, and definiteness, as well as a moderate size; it must be neither too large to be taken in nor too small to be seen properly. Though still regarding art as imitation, he rated it higher than Plato. Plotinus (A.D. 205-270) maintained that objective or creative reason, which is absolute beauty, reduces matter to form. Matter thus formed is beauty. Ugliness exists only in formless matter. Alexander Gottlieb Baumgarten (1714-1762) is historically important as the founder of æsthetics in its modern sense as the science of the beautiful. He attempted to differentiate knowledge into the higher or logical knowledge of the understanding and the lower or æsthetic knowledge of the senses. Beauty he regarded as perfect æsthetic knowledge. Immanuel Kant (1724-1804) used the word æsthetic in its original connotation of sense perception. In his *Critique of Judgment* he places emotion midway between cognition (knowledge) and volition (desire). The test of what we now call æsthetic satisfaction is whether an object of pure contemplation does or does not give free and disinterested pleasure. Beauty has for Kant no objective existence, it is in the eye of the beholder; but it does possess universal subjective validity.

Hegel (1770-1831) in contradiction to Kant, however claims objective reality for beauty. The beautiful he says is the ideal realising itself through sense. The ideal is ceaselessly striving to replace itself in the finite mind but it never gets farther than approximation. He places the highest realisation of the ideal in art rather than in nature. Form is a deliverance from matter and the fine arts from architecture (lowest) to poetry (highest) are a gradual working of the mind out of matter. Schopenhauer (1788-1860) also disagreeing with Kant's doctrine of the subjectivity of matter regarded aesthetic contemplation as a state in which the intellect is completely set free from the will. Freed from the trammels imposed by the will the intellect enjoys a state of bliss which may be ecstatic. Ugliness can exist only when the liberation is incomplete.

In France Claude Buffier (1661-1737) made a scientific investigation of beauty in his *Traité des Vérités Premières* (1717) and was followed in his idea of typical beauty by Henri Taine (1828-1893). The spiritualists led by Victor Cousin (1794-1867) and J. C. Levetue thought all beauty to be originally spiritual thus approaching the Platonic view of ideal archetypes.

British writers may be grouped into Institutionalists and Analysts. Of the former the 3rd Earl of Shaftesbury (1671-1713) following Plato identified the beautiful and the good. Beauty he claimed was apprehended by an internal moral sense. Francis Hutcheson (1694-1746) also postulated the existence in every human being of an internal sense which discovered that uniformity in variety which is the cause of beauty.

Thomas Reid (1710-1796) believed in the existence of independent spiritual beauty from which the beauty of nature is an emanation. Sir William Hamilton (1788-1856) dealt shortly with the relation of taste to the imagination and the understanding.

John Ruskin (1819-1900) claimed that beauty is spiritual and that it is apprehended by the theoretic or moral faculty while the artistic faculty merely deals with the ideas received from nature.

Of the analysts Lord Kames (1696-1782) attempted to discover the elements of aesthetic pleasure. He tends to identify beauty with the pleasant and ugliness with the unpleasant. Sir Joshua Reynolds (1723-1793) adopted Buffier's theory of typical beauty. William Hogarth (1694-1764) treats in his *Analysis of Beauty* (1753) what he calls the fluctuating ideas of taste explaining his serpentine line of beauty. Edmund Burke (1732-1797) tried to find a physiological basis for beauty in his *Inquiry into the Origin of our Ideas of the Sublime and Beautiful* (1756). Archibald Alison (1757-1839) attempted in his *Essays on the Nature and Principles of Taste* (1790) to explain aesthetic enjoyment by the principle of association. Alexander Bain (1818-1903) develops the associationist view in *The Emotions and the Will* (1859). Herbert Spencer (1820-1903) following Schiller's idea of the connection between play and aesthetic activity tried to explain aesthetics in terms of evolution.

Of modern writers George Santayana (b. 1863) contributed to the subject in *The Sense of Beauty* (1896) defining art as objectified pleasure. Benedetto Croce (q.v. b. 1866) treats aesthetics as one of the four grades of his philosophical system and regards it as lyrical intuition. Croce claims for G. B. Vico (1668-1744) a place among the pioneers of the science.

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**Aestivation** (1) In zoology a summer sleep to be compared with hibernation in winter but the inducing

agents are heat and drought instead of cold. It is exhibited by animals, such as land snails, during the hot season in hot and dry countries (2) In botany, the term is used for the folded arrangement of the floral leaves in the flower-bud

**Æthelbert** (560-616), Anglo-Saxon King of Kent, married a French Christian princess. He received the missionary St Augustine, was baptised by him in 597, and built him a church at Rochester. His laws were based on the Roman code. He is honoured as a saint (feast, Feb. 25).

**Æthelred, or Ethelreda** See "LADY OF THE MERCIANS"

**Æthelrith** (d. 617), King of Northumbria, known as Fiesaur. Defeated the Celtic tribes in 603 and 613, isolating Strathclyde from N. Wales.

**Æthelred II** (the *Unready* or *Redeless*) (979-1016), King of England, a weakling who spent his reign alternately attacking and fleeing from the Danes. He continually bribed the Danish leaders, but without much effect. He fled to Rouen in 1013, but was brought back the following year. His marriage with Emma of Normandy was an important antecedent of the Norman Conquest.

**Æthelwulf** (d. 858), became King of Kent, Sussex, and Surrey in 828 and of Wessex in 839, he undertook a pilgrimage to Rome, and perhaps began the payment of Peter's pence. His laws were aimed at benefiting the poor.

**Æthionema** (*Burnt Candytuft*), small bushy or shrubby plants of dwarf growth employed in the rock-garden, requiring well-drained and sunny sites. Mostly pink flowers, with which the plant is covered.

**Ætolia** [E-rō'-LIA], a Greek district, now incorporated with Acarnania, on the N. shore of the Gulf of Corinth or Lepanto. The fertile S. valleys produce maize, fruit (currants), and some tobacco, but the N. district rises to the lofty chains of Parnassus which isolates Ætolia from Macedonia, and is very barren and desolate. Pop.

over 200,000. Chief towns: Lepanto and Missolonghi (q.v.).

**Ætolian League**, a confederacy of the different city states of Ætolia which was formed in the 4th cent. B.C. during the Macedonian supremacy and which grew as Macedonia weakened. The league resisted the invasion of the Gauls (279 B.C.), and, after defeating Boeotia (245 B.C.), obtained control of Central Greece. The re-emergence of Macedonia as a power, however, checked the expansion of the league which was defeated by an alliance of Achæa and Macedonia (see *ACHÆA LEAGUE*). The Ætolians were allied to Rome in the Macedonian War, but resenting certain Roman action obtained the assistance of Syria, and in the war that followed were defeated by the Romans in 189 B.C.

**Affidavit**, in law, a written statement of facts, which must in general be sworn within the deponent's own knowledge made upon oath or solemn affirmation before a magistrate or other person authorised to administer oaths. Affidavits are frequently used in the courts especially in interlocutory proceedings, to dispense with oral evidence.

**Affiliation** (law), procedure for determining the paternity of an illegitimate child and compelling the father to contribute to its maintenance. The mother of an illegitimate child may, within 12 months of its birth, or until it is 18, if the father has contributed to its maintenance, apply to Petty Sessions for an Affiliation Order ordering the father to pay a sum not exceeding 2s a week for its maintenance, in addition to the expenses incidental to its birth or death, if occurring before the date of the application. The mother's evidence must be corroborated. Payment may be ordered to continue until the child reaches the age of 16. A woman who is single, or a widow, living apart from her husband, may apply. There is an appeal to Quarter Sessions, and, on question of law, to the King's Bench Division.

**ILLEGITIMACY**

**Affinity** (chem.) is a measure of

## Affinity

tendency of substances to combine with one another. The term is principally employed in describing the tendencies to mutual combination of acids and bases (*see* CHEMISTRY).

**Affinity (law)** relationship by marriage between the husband and the blood relations of the wife or between the wife and the blood relations of the husband. *See also* CONSANGUINITY.

**Affirmation**, *see* OATH.

**Afforestation** The planting of trees in belts in woods or in forests for the sake of timber prevention of erosion or landslides the conservation of water or amelioration of climate. Work of this latter kind has been largely carried out notably in the British Dominions to replace forest wastage and to influence rainfall. In England afforestation has received systematic attention under Government supervision since 1859. *See also* FORESTRY.

**Affray (law)** an encounter between two or more persons in a public place.

**Afghanistan** (AF GA NI STAN) Asiatic kingdom occupying a key position between W and W Central Asia and Hindustan. It is situated to the N W of India entirely inland with the Soviet Republics of Turkmen, Uzbek and Tadzhik on the N, Persia on the W and Baluchistan on the S. British India and Baluchistan confine the S and E and the Kashmir State the NE. Between Kashmir and the Pamirs a long narrow strip of Afghan territory known as Wakhan extends as far as Tibet. Area c. 50 000 sq. m.

**Relief** Afghanistan is an elevated portion of the Great Iranian plateau and superficially a tangled mountain region covered by the S branch of the Hindu Kush and embracing the watershed of that range from the Pamir Plateau to the Oxus (Amu Darya). Chief ranges are the Sulaiman Mountains (Takt Sulaiman 11 000 ft), the Koh-i-Baba (Shah Tufand 16 900 ft) and the Safed Koh (Sikaram 15 600 ft). The principal river is the Kabul flowing E. past the town of Kabul and through the Khyber Pass

## Afghanistan

to the Indus at Attock. The Hari Rud and the Murghab drain N. and are lost in the desert of Turkestan. The Helmand flows S.E. for 600 m. to the swamps of Seistan on the Persian frontier. It is the longest river of Afghanistan and has the largest drainage area. Afghanistan controls the passes of the Hindu Kush and Britain and her dependencies the passes of the E. and S. The Khyber is the key to India.

**Climate** The climate is of the continental type in the N. from the latitude of Kabul upwards snow lies heavily in winter and the rivers are frozen whilst the summers are intensely hot except in the highest mountains. In the S. the range of temperature is less wide, snow does not lie long in winter although the summer temperature is high. Herat and its neighbourhood has the most temperate summer climate. The S.W. monsoon brings rain only to the fringe of Afghanistan. N.W. winds bring snow in winter and rain in spring.

**Flora and Fauna** A large part of the area is filled by barren rock. The lower slopes are fairly well provided with forest mainly conifers. The valleys well watered from the glacier reservoir of the Hindu Kush are fertile. Irrigation is practised and orchards of peach, cherry, plum, apricot, apple, mulberry and almond trees are cultivated. Vines, lemons and figs are grown in the more N. districts. There are two harvests chiefly of maize, castor-oil plants, madder and asafoetida grow in most parts of the country. Wild animals are found in most parts. Tigers, leopards and lesser members of the feline order, wolves, hyenas, jackals and foxes are the chief carnivores. Wild asses, various types of deer, the Himalayan ibex and markhor are typical of the N. mountain regions. Among domestic animals the fat-tailed sheep is a native of Afghanistan and an important item of diet. Cows and a type of draught horse are also indigenous. The



camel is the principal beast of burden.

**Minerals** Coal, copper, lead, antimony, iron, and gold are known to exist but are very little worked. Gems such as rubies, turquoise, and especially lapis lazuli are exported, principally by smuggling.

**Races** The dominating race is the Durani Afghans, who speak Persian and claim descent (according to one legend) from the lost tribes of Israel. This race has given its name to the country. The mountain borders of



Afghan Warrior

India are inhabited by various Pathan tribes speaking a dialect called Pushtu, the Kafirs, a very backward subject race, in the Hindu Kush, the Uzbeks, natives of Afghan Turkestan, and the Hazaras, a Mongoloid race of the mountain region abutting on the Kabul river valley. The Ahlzaïs occupy the heart of the country on the trade route between Kabul and Kandahar. The Tadjiks are a subject race apparently descended from the original stock of Indo-Persian peasantry. Almost all are aggressive Mohammedans. Some

of the tribes of the N.E. have not been converted long, and the Kafirs (*Arabian heretics*), are complete heathens, practicing a primordial cult.

The Afghans are fair-complexioned with handsome aquiline features, of a powerful physique and a fierce independence of temper. In spite of their claim to Semitic descent they are probably Aryan. There is a large nomadic element among the hill men, whose tribal elements are almost unaffected by the growth of political order, and the blood feud is still common amongst them. The Tadjik peasants and the inhabitants of the big towns are the least fluid elements. There is even a settled element among some tribes which are chiefly nomadic.

The government is now a constitutional monarchy. The king governs with the assistance of a National Council of 106 deputies from the clans and administrative areas, and a Cabinet has been formed. A great assembly of the people is occasionally summoned.

The population of Afghanistan is estimated at 11,000,000. There are a few State-owned factories, the most important of which is, characteristically, a munition factory. The bulk of the population, however, is pastoral and agricultural. The chief towns are Kabul, the centre of government (80,000), Kandahar (60,000), Herat (30,000), and Nazâr-i-Sharif (46,200). These are alike important as fortresses and markets.

The principal exports of Afghanistan are carpets, silks, sheepskin coats, wool, hides, and stock. Timber, fruit and maize are exported to India. Manufactured cottons are the chief imports.

**History** The district, known as Afghanistan since the middle of the 18th cent only, first appears in history as part of the Persian Empire conquered by Alexander the Great. After the decline of the Greek dynasty in Persia, Afghanistan was for centuries the prey of conquerors from the N and W. Mongol conquerors

brought Buddhism from Central Asia and the Saracens Mohammedanism from the W. About the beginning of the 11th cent. Mahmud a Turk king of Ghazni attained great power. His kingdom fell to the Ghor dynasty. In the 13th cent. Afghanistan was invaded by Jenghiz Khan. In the 16th cent. Afghanistan was incorporated in the Moghul empire whose early rulers were kings of Kabul. At last in 1747 Ahmad Khan an officer in the Persian Army but a native of Afghanistan was chosen by the chiefs of the country as ruler and Afghanistan entered upon an independent existence which was confirmed by a great victory over the Marathas at Panipat in 1761. Afghanistan for a time became the greatest power to the N.W. of India but declined towards the close of the 18th century. From the time of Bonaparte's Egyptian expedition the Government of India became anxious about the N.W. frontier of India, a mission visited Afghanistan in 1809 and later the Russian advance in Central Asia induced Lord Auckland to intervene in Afghanistan politics. An expedition styled the Army of the Indus occupied Afghanistan in 1838 and restored Shah Shujah as Amur. A revolt in 1841 of the followers of Dost Mohammed (who had supplanted Shah Shujah before the British intervention) compelled the British brigade at Kabul to sign a convention to evacuate the country. The Afghans made a treacherous attack on the brigade and its camp followers in the Khyber Pass and almost all the British were massacred. Dutt Sale and Pollock restored the prestige of British arms but Dost Mohammed was eventually restored. In 1878 partiality shown to a Russian embassy again alarmed the Calcutta Government. The British once more occupied the country and after several campaigns which included Lord (then Sir F.) Roberts's remarkable march from Kabul to Kandahar (1879) Abdur Rahman was established as Amur. He proved an efficient ruler and did much to preserve Afghanistan

independence. In 1907 a Russo-British convention recognised Afghanistan's political integrity. Russia definitely stating that Afghanistan was outside her sphere of influence. Afghanistan as a Mohammedan country was sympathetic to Turkey in 1914-18. Feeling against Britain developed into war in 1919 but the Afghan attack on India was easily repelled and the war was soon ended. By the treaty of Rawal Pindi 1919 (implemented at Kabul in 1921) Britain released Afghanistan from the tutelage by which she had hitherto been restrained as to foreign relations. Since then a commercial treaty (1923) has improved trade with India. In 1926 the Amur Amanullah adopted the title of King. He showed great diplomatic skill but his attempts to westernise Afghanistan were not popular and in 1929 he was forced to abdicate. After some months of civil disorder the present king Mohammed Nadir Shah Ghazi one of Amanullah's ministers gained the throne (Oct. 1929).

**Afghan Language, see PUSHTU**

**Afghan Wars, see AFGHANISTAN**

**Afion Qarahissar** (otherwise Kara Hissar Sahib) formerly Nicopolis town in Asia Minor and capital of a vilayet. Opium is the chief article of trade. Nicopolis was the scene of a victory by Leo III the Byzantine Emperor over the Saracens in A.D. 740. Pop. 60,000.

**Africa** is the second largest continent of the Old World forming the S. division of its land masses. Situated between the Atlantic Ocean on the W. and Indian Ocean on the E. it is separated from Europe by the Mediterranean Sea and the Straits of Gibraltar and from Asia by the Red Sea, the Isthmus of Suez and the Straits of Bab-el Mandeb. The Suez Canal has artifi- cially completed the severance of Africa from Euro-Asia. The continent extends from 3° 40' N. across the Equator to 34° 15' S. with a greatest length of c. 8,000 m. and from 51° 25' E. to 17° 33' W. with a maximum

breadth of  $c$  4500 m Area,  $c$  11,500 000 sq m

**Geology** Africa is built of very old rocks in a state of great stability seismic and volcanic disturbances are very rare and confined to the younger geological area of the Atlas Mountains, to the coast near the Bight of Biafra, and to the E part of the Rift valley. The E of the continent is covered by Archæan rocks (gneisses, etc.) More recent rocks cover French Nigeria, and limestones are a prominent feature of the coast of Morocco and parts of Egypt, Algeria, Tripoli, and Tunis.

**Coastline** The coastline is remarkably even, owing to the structure of the continent in a series of plateaux whose outer rim falls sharply near the coast. The actual coast is, as a rule, a low, narrow, and sometimes swampy plain. The principal indentations are the Gulfs of Cabes and Sidra on the Mediterranean, and the Gulf of Guinea on the Atlantic coast. Length of coast is  $c$  16,000 m. Islands are not numerous. Madagascar is the largest, others are Socotra, the Seychelles, Mauritius, and Réunion in the Indian Ocean, and Ascension, St Helena, Tristan da Cunha, Cape Verde, and Canary Islands in the Atlantic.

**Relief** The basins of the Congo and Upper Nile form a rough division between two systems of plateaux. The N system is the lower in mean elevation ( $c$  1000 ft), and reaches from the Nile valley to the Atlantic N of the Gulf of Guinea. The S system embraces the whole continent E and S of the Nubian Desert, Upper Nile and the Congo Basin, it is much loftier (mean elevation  $c$  4000 ft), and is characterised, particularly in S Africa, by a terrace structure descending towards the coast. The interiors of the plateaux tend to be somewhat hollow, and include large areas of desert (Sahara, Kalahari). The mountains are isolated systems superimposed on the plateaux. The highest mountains are Kilimanjaro (19,300 ft), Kenya (17,000 ft), Ruwenzori (16,800 ft), Kamerun (13,370 ft). The Atlas

Mountains are a folded range in the NW, which is a geographical continuation of the European system. The Abyssinian highlands and the mountains of E Central Africa are of volcanic origin. The Drakensberg Mountains in the SE are a greatly elevated section of the plateau rim, as are the Kamerun Mountains in Nigeria.

**Rift Valleys** Extensive faulting of the plateaux in E Central Africa has resulted in a remarkable series of valleys which are collectively the most striking feature of African geography. Three systems articulate from a deep main valley, in which lies Lake Nyasa. The two chief run NW and NNE respectively from the head of this lake right across Central Africa. A minor system has been observed trending E from the E shore of Lake Nyasa. The fractures are not continuously parallel and have a direction of their own NW to SE or NE to SW, independent of the general trend of the series. The subsidence of considerable sections of earth crust between parallel fractures, however, justifies the title of "Rift" valley, being applied to the system as a whole. Earthquakes still occur in this region and signs of volcanic activity are everywhere apparent.

**Rivers** The principal African river drain N and W, only the Zambezi and Limpopo drain SE to the Indian Ocean. There is no well-marked continental watershed. The Rift valleys, their lakes, and the central depression are a principal source of drainage. In this region rise the Nile, Congo, Zambezi, and Limpopo. The Orange and Vaal rivers flow SW across the S African tableland, and the Niger, Gambia, and Senegal drain the plateau and highlands of French W Africa. Numerous smaller rivers, the Volta, Ogowe, Kunene, and Kwanza, flow to the Atlantic from local watersheds on the W coast of Africa. The lower courses of all the great rivers except the Nile are impeded by rapids.

**Lakes**, among the world's largest, are

chiefly found in the Rift valleys. The great exception is Lake Victoria lying in a shallow depression between the principal bifurcations of the Rift system. Lakes Albert Nyanza, Albert Edward, Nyanza, Tanganyika and Nyasa occupy the main and N.W. valleys. Lake Rudolf is in the N.E. Rift. Lakes Bangweulu and Mweru are smaller lakes feeding the headstreams of the Congo. Lake Chad is a centre of inland drainage in the S. of Central Sahara.

**Climate** Nearly three-quarters of Africa lies within the tropics and so the average temperature is high; the climate of Central Africa is very unhealthy although ameliorated by scientific sanitation in the European settlements. There are four main climatic belts which vary from the extremities of the continent to the Equator in zones roughly parallel to latitude. The N.W. coast and the coast of Cape Colony enjoy a Mediterranean climate with fairly heavy winter rains and a long dry summer. These regions are succeeded by almost rainless desert areas and then by a zone with heavy summer rains on each side of the equatorial region. This last extends for about 5° N. and 5° S. of the Equator; it is a zone of almost continual heavy rainfall. The district about Mount Kamerun is one of the wettest in the world. The mountain masses of E. Central Africa greatly modify this general distribution parallel to latitude: Kenya, Tanganyika, Nyasaland and Uganda, owing to their elevation, enjoy an equable climate and the heating of their mountain mass in summer induces modified monsoon rains. Rainfall upon the whole tends to be more evenly distributed throughout the year on the S.E. coast of Africa than elsewhere, as the prevailing winds here blow over the ocean and the desert belt is confined to S.W. The desert regions of Africa are afflicted by hot dry winds (sirocco, simoon, etc.).

**Flora** Vegetation throughout most of Africa varies in well-defined belts

with the distribution of rainfall. The Tell Atlas and the S. terraces of Cape Province produce the typical Mediterranean thick-skinned fruits (vines, oranges, etc.). The Congo Basin, Guinea and Mozambique coasts are covered by tropical forest. Great savannah belts of open forest (typical tree baobab) and grassland cover a large part of Africa shading into steppe land and finally into desert. From the tropics to 30° N. and S. is a desert belt continuous in the N. and confined to the S.W. in the S. The N. deserts are occasionally interrupted by oases usually of date palms but sometimes permitting cultivation. The typical vegetation of the semi-desert and steppe is a thorny scrub. Irrigation has made the deserts bordering the Nile into a fertile agricultural district. In S.E. of S. Africa is a region of vast heaths. The normal distribution of African flora is modified in the mountain regions and high plateaux, passing through open grassings to Alpine and in E. Africa to Arctic flora. Giant lobelias are typical of the forest clothing the lower slopes of the E. African mountains. Mangrove swamps are a feature of the lower courses of rivers in the equatorial area.

The distribution of the principal crops is as follows: cotton in Egypt, Nigeria, Kenya and Rhodesia; sugar cane in Egypt; rubber in Belgian Congo, Gold Coast, Kenya, Liberia, Abyssinia and Madagascar; cereals in Egypt, the Tell and S. Africa; coconuts in W. Africa; tobacco in Rhodesia, Egypt and the Tell.

**Fauna** The fauna is very striking in Africa with Brazil, the Deccan and W. Australia once formed part of an ancient continent and this fact has impressed certain common characteristics on the fauna of each. A low order of mammals is found but the marsupials have disappeared. Of the carnivores the lion, leopard and hyena are African types. The hippopotamus and the small river hog in Madagascar are survivals of the glacial epoch. In Madagascar also are

lemurs and some very primitive carnivores. The elephant, rhinoceros, and the great apes which are characteristic of the mainland have not reached Madagascar, but the amphibians of the island are also found in S.E. Asia. A striking feature of Africa is the absence of true cattle save

the Union of S. Africa and Egypt. Iron ore is mined in the Atlas Mountains. Diamonds are found near Kimberley, in S. Africa, on the Gold Coast, and in Belgian Congo. Coal is worked in the Drakensberg.

*Races.* See AFRICA, PLOPLES OR

*Language.* French is widely spoken in N. Africa, as is English in the South. Swahili, a speech formed by the infiltration of Arabic into a basic Bantu speech, is a common vehicle of communication in E. Africa. The native speech of N. Africa (Egypt and Barbary) includes various dialects to some extent impregnated with Arabic phrases, but structurally Hamitic. The speech of the negroes falls into two great families, Bantu and Sudanic (q. v.). See also BUSHMAN LANGUAGES, HOTTENTOT LANGUAGES.

*Religion.* The Berbers and the bulk of the Egyptian natives have been Mohammedans since the Arab conquests. The Copts of Egypt and the Abyssinians have, however, preserved in a rather debased form the Christianity once general in the kingdom of Nubia (see ABYSSINIA). The N. tribes of Sudan are mostly Mohammedans, those of the S. tend to share the beliefs of the negroes. Save for a limited number of converts to Christianity, the negro tribes practise various primordial cults. Fetish and nature worship are common, ancestor worship is usual among the Bantu, qualified by a vague belief in some overruling supernatural power. There is general credence in evil spirits, magic, and witchcraft, the medicine man is an influential member of the tribal community.

*Population and Commerce.* Africa is much more thinly peopled than Europe or Asia. The continent is commercially important for its metallurgical resources and for its tropical raw materials. Most of the inhabitants are engaged in primary production, cultivation, stock-rearing and the extractive industries. Considerable areas are visited only by nomads, and the clearings of the equatorial forests are still



Larding a Crocodile in East Africa

as importations. The Sahara Desert and the E. rifts belong to more recent geological epochs, and have hindered immigration of later types. The chief reptiles of Africa are similar to those of S. America, and include crocodiles, chameleons, and lizards, snakes are the python and puff adder. The ostrich is characteristic of the S. deserts. Herds of antelope and zebras roam the great S. grazings. The tsetse fly, a pest deadly to stock, is now peculiar to Africa.

*Minerals.* Gold and platinum are found on the Rand and in the Lydenburg district of the Transvaal. Some copper is worked in the Ookiep district of Cape Colony. Nigerian tin is important. There are deposits of manganese ore on the Gold Coast, in

occupied by communities subsisting by primitive agriculture and hunting. The Nile valley is the only densely populated agricultural area in W Africa and Kenya cultivation is highly developed and specialised but the inhabitants are widely scattered. The Transvaal and Nigeria are the most important mining areas. Chief imports are machinery (mining, railway and refrigerating plant), coal, manufactured cottons. Chief products (*see also* under separate districts) are cocoa (c. 50 per cent of world output), cotton, wheat, barley, maize and rubber, wool, hides and ivory, gold (half the world's supply), platinum, tin, manganese and iron ores. Almost all the world's diamonds are mined in Africa. Some tobacco is grown in Rhodesia and N Africa and imported by Great Britain and Iran respectively.

The principal towns, with the exception of Johannesburg, the centre of the Transvaal mining area, are ports or Government centres. The largest are Cairo (1 100 000), Alexandria (573 000), Algiers (57 000), Tunis (90 400), Johannesburg (203 300), Cape Town (151 000), Durban (86 000), Port Said (104 600) and Nairobi (85 700). Total pop. est. 145 000 000.

**Political Divisions.** The present political divisions of Africa are mainly a consequence of the expansion of European influence in the mid 19th cent., modified by post War treaties and mandates. The British Empire now occupies a continuous block of territory from the Cape to the Upper Nile, comprising the Union of South Africa with mandated S.W. Africa, Rhodesia, the mandated Tanganyika Territory, Kenya, Uganda, as well as the isolated district of Somaliland. British territories in W Africa are in discontinuous blocks bordering on the Guinea Coast. They are Nigeria, Gold Coast, Sierra Leone, Gambia, and the Kameruns. Britain also holds the islands of St Helena and Ascension, the Seychelles, Socotra

and Mauritius. The Anglo-Egyptian Sudan is jointly administered by Britain and Egypt. French possessions are Morocco, Algeria, Tunisia, French W Africa, French Equatorial Africa, French Somaliland and Madagascar. Portugal has Portuguese Guinea, Angola (S.W. Africa) and Portuguese E Africa (Italy, Tripolitana and Cyrenaica). Italian Somaliland and Eritrea, Belgium annexed the Congo Free State in 1908, Rio de Oro with the Canary Islands, part of Morocco, and Rio Muni (Guinea Coast) belong to Spain. Independent states are Egypt, Abyssinia and the negro republic of Liberia.

**Communications.** European capital has done much to remedy the defects of African inter-communication. Roads are still few, but a great advance has been made since the mid 19th cent. in railway and steamer transport. There is inland navigation on the Middle Congo, Upper Nile and the Great Lakes. A railway was opened in Egypt in 1855, but in 1890 the continent was still practically without a railway system. The political settlement after 1885 stimulated schemes for rail construction. The railways of S Africa extend S.N. as those of Egypt extended S, and it is now possible with the aid of steamboats to travel by rail from the Cape to Cairo almost entirely on British territory. There has been important railway development in Belgian Congo, an agreement with Sudan has made possible trans-continental travel E and W by rail and river. The French have developed their railway system considerably in the N.W. Many lines run from ports in different parts of the continent to their economic hinterland.

**Civilisation.** The civilisation of N Africa has always tended to follow a separate course. Hamitic culture was apparently more influential in the F Mediterranean than in the African continent, from early times the N African littoral was linked to the fortunes of the Mediterranean empires. The rest of Africa has been more backward than

Europe or Asia in civilisation. The root cause of this comparative unprogressiveness lies, no doubt, in the



African Native Art in Bronze

to have advanced beyond the stage of the tribe or tribal league. There are great differences between the advances made by different tribes. The Zulus and some tribes of W Africa have shown great political abilities. The ruins of Zimbabwe and the stone villages of Rhodesia, now considered the work of negro architects of the Middle Ages, display a great advance on the villages of primitive man, and a progressive civilisation perhaps connected with a trade in gold. The pictorial and domestic arts reached a high level in remote times (e.g. the rock paintings of the Bushmen), but no great improvement seems to have been attained at a later date.

*History.* African history is, save

for Egypt (qv), largely that of the external Powers which have effected a settlement in the continent. In antiquity the N coast was colonised by the Mediterranean maritime Powers. Semitic traders from Tyre and Sidon founded Carthage about 800 B.C., and built up a strong empire, and the Greeks colonised Cyrenaica. Republican Rome utterly destroyed the Carthaginian empire after a long struggle (146 B.C.). Cyrenaica and Egypt were subsequently absorbed, and the Romans gave to their conquests the name which has since been applied to the whole continent. With the collapse of the W Empire, the Vandals secured Africa, with the exception of Egypt, but their kingdom had a short life. Africa was recovered in A.D. 533 by Belisarius, the Byzantine general, but this reconquest failed to arrest the general decline. In A.D. 640 Egypt was conquered by the Arab followers of Mohammed, and the rest of N Africa was overrun in less than a hundred years. The Arabian empire declined through internal dissensions, the Turks gained Egypt, and by the



African Idols

Left to right

- 1 A Hunting Idol
- 2 Ceremonial Mast
- 3 Goddess of Fecundity (in wood)

15th cent. the Berbers were practically independent under a loose Ottoman

suzerainty. In the 15th cent. the States of W. Europe led by Portugal entered upon that course of exploration and colonisation which continued intermittently for four centuries. Most of the Portuguese settlements were made on the S.W. and E. coasts where they fought the Arabs for trade and political influence. At the close of the 16th cent. Portuguese power was waning and that of the Dutch on the rise. In 1652 the latter settled at the Cape but the goal of their ambitions lay in the E. Indies and they did not colonise Africa extensively. Britain established a factory on the W. coast at Goree in the 17th cent. but the next great step towards the European domination of Africa was not taken until early in the 19th cent. Britain had acquired the Cape at the close of the Napoleonic Wars and the Dutch Boers in disagreement with their new masters began to move N. founding the Transvaal and Orange Free State. In 1830 France began her long conquest of N.W. Africa. Following the explorations of Central Africa in the mid-century the scramble for Africa began in which most of the great European Powers were involved. Considerable friction arose between the competitors and in 1884-5 the Berlin Conference delimited the various spheres of influence. Britain, France, Germany, Portugal and Italy were the Powers chiefly interested and Africa was virtually partitioned between them. The Congo Basin was administered by the King of the Belgians as the Congo Free State, an independent Power. Between 1879 and 1892 Britain overcame the resistance of the Boers and of the native tribes such as the Zulus and Matabele and consolidated her power in S. Africa. In 1910 the Cape of Good Hope with Natal and the conquered Dutch republics of Transvaal and Orange Free State became the Union of South Africa (*see* BRITISH EMPIRE). Between 1883 and 1893 Britain attained supremacy in E. Africa. In 1908 the Congo

Free State became a Belgian colony. After the Great War Germany was deprived of her colonies in Africa and they were redistributed as mandated territories chiefly to Britain and the Union of South Africa. In 1914 the British protectorate over Egypt was withdrawn and Egypt became an independent kingdom.

**Slavery.** Africa was for centuries the principal slave market of the old Arabs and Europeans alike pursued this traffic until recent times. The Elizabethan Sir John Hawkins is said to have initiated the English share in it but it is probable that earlier freebooters had been engaged. Slavery was abolished in the British Empire in 1833 but the Portuguese Spaniards and Arabs continued the trade until much later and it was only suppressed after a prolonged struggle lasting into the present century.

**Exploration.** The geographers of antiquity seem to have had a clear notion that Africa could be circumnavigated and the Carthaginians sailed down the W. coast as far as Sierra Leone and possibly even round the continent. Ptolemy surmised the lake sources of the Nile and he had heard of the Niger. The Arabs reached the middle course of the latter in the 10th century. In modern times a series of voyages begun through the enthusiasm of Henry the Navigator carried the Portuguese keels gradually S. until in 1488 Diaz rounded the Cape of Good Hope. In 1498 Vasco da Gama entered the Indian Ocean and exploration of the E. coast began systematically.



Livingstone.



exploration of the interior was deferred until the close of the 18th cent, the African Association having been founded in England in 1788



Stanley

James Bruce and Mungo Park were the forerunners of Livingstone, Speke, Grant, Burton, Baker and Stanley, whose discoveries were the peak of exploration in the 19th century

Collectively they solved the mystery of the Nile sources, explored the Great Lakes, and traced the Congo and Zambezi from source to mouth. Livingstone traversed Central Africa from W to E. The last and greatest



African Routes of Explorers

of the pioneering journeys was made by H. M. Stanley, Livingstone's rescuer, who, between 1874 and 1877, completed the exploration of the Great

Lakes and followed the Congo down to the W ocean. Much valuable work was done both during and after the great explorations in a more restricted field by travellers of many nationalities, and their work and that of their successors (often Government surveyors or civil servants) has left little that is dark about the continent.

**Africa, Peoples of.** The population of Africa may be separated into two main ethnic divisions, Caucasian and Negroid, the former occupy the N area, bordering the Mediterranean, the latter the remainder of the continent.

The Semitic peoples (Arabs) are not regarded as an indigenous population,



African Types, North Bedouin Arab Girls

but as an influx taking place about 1000 years ago, and overlying the aboriginal *Berber* inhabitants.

The early Egyptian type is not altogether extinct, being represented by the Beja tribes of the Anglo-Egyptian Sudan and adjacent districts. The Arab invasion, politically important, is negligible from the ethnic point of view.

**Modern Egypt** This home of ancient culture is to-day occupied by two groups, the *Fellahin* and the *Copts*. Passing from Lower to Upper Egypt skin colour grows darker and hair crisper, indicating a small per-

centage of negro blood among the Fellahin whilst the Copts (Egyptian Christians) remain fairer thinner lipped and narrower nosed. The Leja and Bisharin tribes dwell on the desert borders of Egypt and do not intermarry with desert Arabs.

The true aboriginal people of the N. the *Berbers* are found in the ancient land of Barbary now represented by Tunis Algeria and Morocco.

Westermarck distinguishes a group of Berbers

- (1) The Ruafa (or Rif)—coastal
- (2) The Beraber—Morocco mountains
- (3) The Shleuh—Atlas Mountain and Atlantic coast
- (4) The Draa—South Morocco
- (5) The various tribes in the vicinity of Ujda

The Berbers are in the main tall good looking and particularly white skinned. They are a settled agricultural people more steady and steadfast than their Arab neighbours.

The Sudan Here the population



Afr. W. in Fed. g. Lab.

falls into two groups N. Mohammedans and S. Pagans the former being Hamitic and the latter Negroid though both are somewhat mixed and no hard and fast line can be drawn across the map. Here the Negroes are of a primitive physical type very black prognathous and with thick everted lips.

In Africa Nomadic tribes represent the early inhabitants. They live by trapping and hunting have the blacksmith's craft and are greatly feared as sorcerers.

There are 3 types of settled people (1) Bantu (2) Nilotic (3) Nilo-Hamitic. The Bantu people are an early mixture of Negroes and Hamites the Nilo-Hamites represent an invasion.

The coastal area Zanzibar and Pemba are occupied by the Swahili speaking a Bantu dialect but having a different culture. Farther S. in Tanganyika and Nyasaland the Hehe and Yao people are still Bantu military characteristics due to influence of the Angoni.

Zulu who came N The Angoni were conquered by the Nyamwazi, another people of Zulu invaders This area has been a battle-ground of tribesmen for centuries past

*W Africa* The pygmies (Negrillos) interbred with Negros, and then, becoming mixed with Berbers, Hamites, and Semites, produced high-grade tribes such as the Bornuan, Kanuri, Hausa, Mandingo, Yoruba, and Ashanti people, who live in small independent groups, having as a rule a priest-king or one sacred and one secular chief They have Sky and Earth gods and numerous lesser deities They practise witchcraft and lycanthropy (*q v*.)

*S Africa* South of the Zambezi the country is peopled by Bantu, Hottentots, and Bushmen The last-named are short in stature, yellow-skinned, and nomadic in habit The Hottentots resemble the Bushmen in physical characteristics, but are a settled, cattle-raising people The Bantus are subdivided into Kafirs, Fingoes, and Zulus, and numerous other tribes, of which the Mashona of Rhodesia are perhaps the best known

The Bushmen pray to the moon, and also believe in various demons and rain-making spirits The Hottentots are in the main hero-worshippers (*see* PRIMITIVE RELIGION), but they, too, have lunar cults and a great deal of Tabu (*q v*) and ritual relating to cattle The Bantu people are, in the main, ancestor-worshippers, but they also possess an ill-defined sky cult connected with rain-making The Zulus are the most important people of the area Their great hero is Chaka, who introduced discipline, and established a military regime

*African Lily* (*Agapanthus umbellatus*; *Love-Flower*), a beautiful plant for green-house culture, with sword-like leaves and umbels of blue or white flowers on long stems In tubs or large pots the plants may be used out of doors in the summer, when they should have plenty of water and liquid manure. Soil loam, leafmould, de-

cayed manure, sand Requires very little water in winter

*Afrikaans*, or Cape Dutch, the sort of Dutch spoken and written by the Dutch or Boer element in the white population of S Africa. It has lost some of the inflections of the European form of the language, and adopted some features from English

*Afterdamp*, *see* COAL MINING

*Agadir*, seaport in S Morocco formerly of considerable importance but now in decay, it is the most southerly port in the country In 1911 Agadir was associated with a diplomatic crisis which almost precipitated war between France and Germany, the German gunboat *Panther* being despatched there as a reply to the extension of French influence in the country (*see* WORLD WAR) Pop c 2500

*Aga Khan I* (1800-1881), who traced his descent from the daughter of Mohammed, was a member of the Persian royal house He was appointed Governor-General of Kerman but was forced to flee from the wrath of the emperor Fateh Ali Shah, and eventually settled in Bombay He helped the British in many ways through his position as spiritual head of Mohammedan British subjects

*Aga Khan III* (b 1875), who succeeded Aga Khan II in 1885, has done much work in India for British and Mohammedans alike The latter followed him to the Allied side in the Great War The Aga Khan played an important part in the Peace and

#### Key to the Accompanying Illustrations of African Types

- A Young Mangbetu Girl
- B Woman from Lake Chad Region
- C Sudanese Negro
- D Woman from Niger Region
- E Woman from Lake Chad Region, with purposely deformed lips, a custom dating from the days of the Slave Trade, women so mutilated not being abducted by the traders
- F Native Girl from Rhodesia
- G Witch doctor from the Kavirondos
- H Kavirondo Youth
- I Nuer, Adult Male
- J Central African Witch-doctor
- K Warrior of the Masai Elnoran

## AFRICAN TYPES



Round Table Conferences, and was recommended in 1923 for the Nobel Peace prize. He is also famous as a racehorse owner.

**Agamemnon**, Homeric hero, and subject of a tragedy by Æschylus (*q v*). He was king of Mycenæ and leader of the Greek forces at the siege of Troy, where his quarrel with Achilles took place. Before sailing for Troy from Aulis he was advised to appease the gods by sacrificing his daughter Iphigenia (*q v*). Returning home with Cassandra, his prize from Troy, he was murdered by Clytemnestra, his wife, and Ægisthus, her lover. He was avenged by his son Orestes, who killed his mother and Ægisthus.

**Agape** [*pron* AG-Ū-PE'] (love feast), a communal meal celebrated by the Early Christians, generally in the evening, as a preparation for or sequel to the Eucharist.

**Agapetus I**, Pope (535-6), established an ecclesiastical library at Rome.

**Agar-agar**, a gelatinous material prepared from certain types of seaweed found in the Pacific Ocean on the coasts of Japan, China, and California. Its chief use is as a culture medium in bacteriology (*q v*), it is also used as an adhesive, as a size for silk, and in the manufacture of certain foods.

**Agaricus**, *see* MUSHROOM.

**Agassiz, Louis J. R.** (1807-1873), Swiss naturalist and authority on ichthyology. He gained the Wollaston prize (1834), and held professorships at Harvard, U.S.A. A natural history society is named after him.

**Agate**, a non-crystalline form of silica (*q v*), widely used for objects of art. Found associated with lavas. Shows beautiful bands of colour, each colour depending on a particular form of impurity in the silica as it was deposited, layer upon layer, from water. The main centre of polishing is at Oberstein, in Germany, where the industry has gone on since the 15th cent. Agates may be artificially coloured, but the colour rarely penetrates far, and thus can be detected by slight chipping. They occur in the U.S.A.,

Canada, New S. Wales, and S. Africa, and in England in the Cheviot and Mendip Hills. The variety "Moss Agate" is due to manganese in crevices in the silica. Found in Rocky Mountains, India, and China.

**Agatha, St** (*d* 251), patron saint of Catania, Sicily. Legend states that she was a noblewoman who repelled the advances of the Roman prefect, for which he sentenced her to be burnt at the stake. But this was prevented by a miraculous earthquake, and she died in prison. Feast, Feb. 5.

**Agatho**, Pope (678-81), was the first of the Popes to refuse to pay tribute to the Emperor at Constantinople.

**Agathocles** (361-289 B.C.), tyrant of Syracuse. Of humble birth, Agathocles became the general of a mercenary army which conquered Sicily with great bloodshed. He fought against Carthage, but was defeated. He was proclaimed King of Sicily, but frequent revolts disturbed his reign.

**Agave** (*Aloe*), a genus of the family Amaryllidaceæ, suitable for large pots or tubs. Can be planted in the garden if given winter protection. The American *aloe* is the species usually grown. It has thick, fleshy, thorn-pointed leaves, and sends up a tall flower-spike, and then dies. Suckers potted up will form new plants. Soil: fibrous loam, sand, and old mortar, made very firm. Much water is required in the summer. *See also* NARCISSUS FAMILY.

**Age**. In law, human life is divided into periods corresponding approximately only to the physiological divisions and varying in each country and according to the purpose for which the grouping is made. The main divisions are into infancy or minority, and majority. The former usually lasts until 21, when full civil rights are acquired, though in some countries the franchise is withheld until the age of 25. In Spain minority ceases at 23. In England, until 1929 a female could marry at 12, a male at 14, but this age was raised in 1929 to 16 for both sexes. Marriage may not,

however take place before the age of 1 unless the consent of the parents or guardians or of a magistrate is obtained. In France a female may marry at 15 in Germany at 16 and males at 18 and 20 respectively the consent of the parents is required until the age of 16.

In English criminal law (q.v.) an infant under 7 cannot be guilty of a crime and a boy under 14 cannot be convicted of carnal knowledge of a girl under 13 though he may be convicted of assault. Full criminal responsibility attaches to children aged 14 or more but the Children Act 1908 provides for special treatment for a new group of offenders called juvenile offenders i.e. persons under 16 with the object of removing them from the contaminating criminal influences of prison associations. See also CHILDREN'S COURTS REFORMATORY SCHOOLS INDUSTRIAL SCHOOLS.

**Agen**, capital of the department of Lot-et-Garonne in SW France and seat of a bishop. Trade in prunes, brandy and textiles. Formerly capital of the province of the Agennais there are considerable remains of the Roman town (*Aginnum*). Pop. c. 20,000.

**Agency** in law a relationship between two persons whereby the one called the agent is authorised expressly or by implication to act on behalf of the other called the principal. It is distinguished from the relation of master and servant by the fact that the principal has only the right to direct what the agent is to do whereas a master has in addition the right to say how it is to be done. Furthermore the agent is generally employed for the particular purpose of bringing his employer into contractual relations with others. The contract of employment may be express or implied. It is implied e.g. in cases of necessity thus the master of a ship is not normally the agent of the owners of a cargo but in cases of necessity has the power to sell the cargo on behalf of the owners in order to save its value or part of his authority may be

given to the agent expressly or by implication. Thus an auctioneer is primarily the agent of the vendor but during the auction he enjoys the implied authority of the purchaser to sign a memorandum of sale on his behalf so as to comply with the Statute of Frauds or the Sale of Goods Act. The duties of the agent are (1) to conform to the instructions of the principal (2) to use care and skill in the performance of his obligations (3) to pay to the principal all money received on his behalf subject to his right of lien (q.v.) to secure the payment of his commission and expenses (4) to make full disclosure of all material facts to his principal (5) not to receive any secret profits or bribe in the course of the transaction. He has the right to remuneration reimbursement for reasonably incurred expenses and indemnity against the consequences of a tort committed by him in pursuance of his principal's instructions provided that the act was not of itself unlawful and that the agent did not know it to be unlawful. The effect of the contract of agency upon the position of third parties varies according to circumstances. (1) The agent may disclose the fact of his agency and the name of his principal. In that case he is a mere conduit pipe who cannot sue nor be sued in regard to the transaction unless (a) he executes a deed on his principal's behalf though in his own name (b) he signs a negotiable instrument without clearly disclaiming liability. Also by trade custom a broker effecting a policy of marine insurance is responsible to insurer for the premium. (2) Where the name of the principal is not disclosed it is a question of intention depending upon the particular circumstances whether the principal is to be liable or the third party can sue either the principal or the agent. (3) If the agent contracts in his own name disclosing neither the name of the principal nor the fact of the agency the other party has the option within a reasonable time after ascertaining the identity of the principal to elect to

treat either the principal or the agent as the person with whom he contracted (4) If one person contracts without authority as agent for a named principal, there is no contract between the principal and the third person, but the latter has the right to sue the person with whom he dealt for damages either for deceit, or for breach of warranty if that person acted in good faith, since by implication of law he is held to warrant the existence of his authority (See also MARRIED WOMEN).

**Agents-General**, representatives in England of the British Dominions, whose political and economic interests they protect, and whose products they make known. Their office is similar to that of a High Commissioner.

**Ageratum** [AJ-ER-Ā'-TUM] (family Compositae), tropical and sub-tropical half-hardy annual plants, much used as an edging for borders, with close panicles of blue or white flowers. They prefer a light, rich soil, and are propagated by seeds or cuttings, which latter root freely early in the spring. There is little difficulty in keeping the plants through the winter.

**Agesilaus II** [A-GE'-SI-LĀ'-ŪS], King of Sparta (401-362 B.C.). He indecisively defeated the Athenians, Thebans, and their allies at Coronea in 394, supported the Peace of Antalcidas (387), and urged Cleombrotus to undertake his disastrous campaign against Thebes, which ended in the battle of Leuctra (371) and the loss of Spartan hegemony.

**Agglutinative Languages**, a term used to distinguish those languages in which, unlike inflexional or analytical languages (see LANGUAGE), words are formed by joining into one word two or more separate words or word-roots. For example, *henhouse* is an agglutinative word, in *hen's house* the word *hen's* is inflexional, in *house of hen* the whole concept is analysed out into its component parts. The chief agglutinative languages are Mongolian, Turkish, and Hungarian.

**Agincourt**, village in N.E. France (department Pas-de-Calais). On Oct

26, 1415, Henry V of England was engaged here by the Constable D'Albert, who had intercepted his retreat at Calais. The English were greatly inferior in numbers, but the obsolete tactics of the French feudal levies gave them no chance against the English archers, and Henry V won a complete victory.

**Agnates**, in Roman law, persons related through the male line only, as opposed to cognates, who were also related through females.

**Agnes, St.** Legend states that during Diocletian's reign, Agnes, who was 13, declined the advances of the son of the Roman praetor, and was executed. Her day is Jan. 21. She is the patron saint of young girls, and is generally represented in art in association with a lamb.

**Agnosticism**, the opinion that it is impossible definitely to assert or deny the existence of God and supernatural beings. The agnostic must be distinguished from the atheist, who denies the existence of a deity.

**Agora**, at first the name of the democratic assembly of a city in Ancient Greece, it later came to denote the open space or market-place in which the assembly met.

**Agouti**, or *Aguti*, is a S. American rodent, related to the *CAVIES* (*q.v.*) but higher on the legs. It is of the size of a rabbit, and provided with long erectile hair on the hind-quarters.

Although mostly found in the forest, agoutis may be very de-

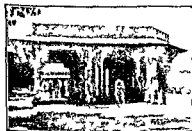


Agouti

structive to sugar-cane and other plantations. On this account, and because of the delicacy of the flesh, they are persistently shot and trapped.

**Agra**, chief town of district and division in the United Province of British India, on R. Jumna, c. 8 m. W.N.W. of Calcutta. A railway

centre with cotton mills carpet and flour manufactures. The city was at one time capital of the Moghul dynasty. It was greatly developed by



Agra

Akbar and includes many splendid examples of Moghul architecture among them the famous mausoleum the Taj Mahal erected by Shah Jehan (163) Pop 230 000

#### Agram *see* ZAGREB

**Agrian Laws** were introduced by the Romans to regulate the fair distribution of public lands for agricultural purposes and pasturing. The Licinian Law introduced by Licinius Stolo 367 B.C. enacted that every Roman citizen on payment of a tax should have the right to graze 100 head of large cattle 500 of small (goats sheep and pigs) on an allotted State land. The Sempronian Law introduced by Tiberius Sempronius Gracchus which gave the right to every father of a family to claim the use of 500 acres and 250 acres for each son, led to a revolt of the nobles and the murder of Tiberius.

**Agricola, Gnaeus Julius** (37-93) Roman Governor of Britain (78-87) who was the first Roman to verify the fact that Britain was an island. Father in law of Tacitus who wrote his life.

**Agricola, Johann** (149-1566) (*Magister Islebi*) a friend of Luther and prominent figure of the Reformation. He held many high positions in university. He taught sm and was an

#### Agricultural Co-operation *see* CO-OPERATION

**Agricultural Credit**, facilities for ensuring an adequate supply of capital in agricultural undertakings. Two types of credit are required by farmers—long term credit for land purchase or improvement and short term credit for financing a single year's crop. In Great Britain there are few specialised agricultural credit associations most facilities being provided by traders and joint stock banks the five main banks lending up to £50 millions in a given year to agriculture. Other forms of short term credit include temporary remittance of rent advance on produce deferred payment to dealers seedsmen etc. The Farmers Land Purchase Company and the Lands Improvement Company cater to a certain extent for long period credits.

In Germany and most other parts of the Continent co-operative credit is common usually in two forms. The *Landschaften* or Credit Unions for long term loans issue bonds on mortgaged estates and on the collective guarantee of its members. The *Raisfens* banks for short term credits base their work on large numbers of small peasant deposits. They often add co-operative purchase of machinery seeds etc. to their banking activities and work with the central loan banks which are supported by the State. Although various similar schemes have been proposed for Great Britain and even under the Agricultural Credits Act 1923 partially provided for the individualist tradition of English farmers has prevented any considerable development. In 1927 however an Agricultural Mortgage Corporation was formed by banking interests which in 1929 had granted over £4 millions in mortgage loans.

In Australia there are in most cases State credit institutions for agriculture while in India co-operative credit on the English model has proved most successful. In the U.S.A. a farmer can raise loans under the Federal Farm Loan System on the mortgage



of his equipment, live stock or produce. In 1928 the total outstanding farm debt of all kinds was estimated at \$12,250 millions (£2500 millions).

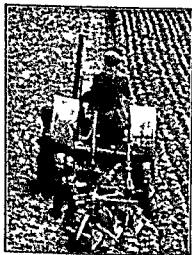
**Agricultural Machinery** Agriculture was probably the first industry to be mechanised. It is not known exactly at what period animals began to be used for ploughing, but in Egypt in the most primitive times the plough was not known. The use of water-power for irrigation (*q v*) is certainly very old, for it is found in all parts of the world, and was used in ancient Egypt and Greece. With the coming of the machine age, the first use of mechanical invention in agriculture was seen in the application of animal power in sowing and harvesting. It is very natural that the horse, which has so many disadvantages as compared with modern motor-driven machinery for town work, should be retained very much longer in the country, quite apart from conservatism and sentiment. However, in the course of the 19th cent. the use of the steam-engine for ploughing and threshing became general. Ploughing was usually done by ploughs cutting several furrows at a time, pulled by means of wire cables operated by a powerful steam-engine of the locomobile type stationed in a suitable position relatively to the field to be ploughed. This system of steam ploughing, developed by Fowler in England, spread all over the world, and enabled enormous tracts of land to be opened up quickly and easily. The threshing machine, first developed for water, wind, or animal power, now came into use also in conjunction with the locomobile steam-engine. At the present day the applications of mechanical power to farm work are multifarious.

One line of development is in the use of *tractors*, petrol-driven locomotives with wheels suited for rough ground, to replace the horse for drawing all kinds of machinery used for tillage. The tractor has been developed on an enormous scale in America, and to a

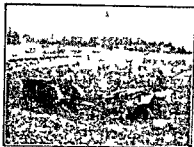
less degree in Russia. In many cases "caterpillars" have to be used instead of wheels, owing to the nature of the ground. The use of tractors in place of horses is a matter the economics of which vary greatly from place to place. The tractor works much faster, and hence a greater area can be farmed per man employed. In many cases the climate makes it difficult to use horses efficiently, since they do not work well in great heat. For stationary machines electrical power is frequently used, sometimes generated by windmills, electricity is also employed for tillage, but the expense of transmission to outlying parts of a farm is against it. Great efforts have been made to develop general-purpose power units which will serve both as tractors and for driving stationary machinery such as chaff-cutters, cake-breakers, separators, milking machines, and so on. Power (wind, oil, gas, or electricity) is also extensively used for barn machinery—threshers, baling presses, chaff-cutters, root-cutters and pulpers, grinding mills, and shearing machines. Electricity is economical in dairying for cleaning and sterilising apparatus, milking machines etc.

The first *sowing machine*, or *gran drill*, was invented in England in 1771 and this type of machine has been developed continuously to a point of great perfection. It sows many rows of seeds at once, applying also a fertiliser and covering up the furrow. Such machines are now very economical, since they can be adjusted to supply exactly the right amount of seed and fertiliser.

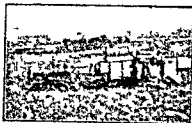
*Harvesting machinery* includes a great variety of machines for dealing with various types of crops. *Mowing machines* for grass and cereal crops can be used only when the ground is suitable, and the crop not laid, in the latter case resort must be had to the scythe. Modern reaping machines cut the crop, bind it into sheaves, and may also convey it to a sheaf carrier. These machines are known as *self-*



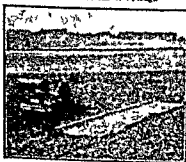
Three-furrow Mole in Plough



Harrow



Cut or Thresh and Harrow



Tractor with Smoothing Harrow



Working the Harrow

*courtesy of the International Harvester Co. of U.S.A.*

*delivery* or *sail-reapers* when they carry the cut corn clear of the machine and drop it on the ground for hand binding, and as *self-binders* when they bind it into sheaves.

Machines for harvesting root crops are much more difficult to use satisfactorily, owing to the danger of damaging the crops, or to the nature of the ground. Potato ploughs are the simplest type, they simply raise the potatoes by a series of prongs. More elaborate machines are made which actually lift the potatoes and sift the earth from them, but they still require to be picked up by hand afterwards.

**Agricultural Wages** date from the time of the collapse of the feudal system, which was hastened by the Black Death in 1348, and the subsequent shortage of labour. Wages were high until Elizabethan times, when they were heavily reduced by the Justices of the Peace. The extreme poverty of the agricultural labourer was relieved in 1745 by grants from the rates, but this had the effect of still further reducing wages to between 4s and 8s a week. A violent protest in 1830 was suppressed, and no Government action was taken until 1917, when an Agricultural Wages Board was established and a legal minimum wage fixed. This system was abolished in 1921, but revived in 1924, though the emphasis then was upon district committees, formed by representatives of the farmers, the labourers, and the Ministry of Agriculture.

The minimum wage under the Corn Production Act, 1917, was 25s a week, and with rising prices this was raised to 46s 10d in Aug 1920. The Act of 1924 fixed a minimum of 28s, which was raised to 31s 8d by 1927. In June 1932, the minimum wage in 35 out of 40 areas was between 30s and 32s 6d, the maximum being 37s 6d in N and W Lancs, and the minimum 28s 6d in Gloucester and Berkshire, the former for 60 hours work a week, the latter for 50. The average mini-

mum agricultural wage for women was 5d - 6d an hour.

**Agriculture** covers everything connected with the cultivation of the land. Its origins are far back in history, but its existing technical and social forms are surprisingly modern, dating only from the middle of the 18th cent. Before that time, agriculture was traditional, and took the form mainly of subsistence-farming, only the most primitive methods of rotation and breeding being employed. It was linked with social organisation, being generally in a better state where institutions were more liberal, as is evidenced by the progress of agriculture under the Roman Republic. As a natural result, the roots of modern agriculture are found in the freedom of 18th-cent England, and, together with the specialisation involved in the Industrial Revolution, have led by steps to the purely commercial agriculture of to-day. It can now be divided broadly into tillage or arable cultivation (the growing of main or field crops), horticulture (as far as it is concerned with the growing of vegetables), and fruit (kitchen-garden work and market gardening), livestock breeding (including dairying and horse breeding) and forestry (so far as it concerns the economic development of the land and the preservation of the soil). Although each of these involves specialised exploitation, they are not entirely separable, as one influences the other.

**Soils and their Management.** The first consideration is the character of the soil, the second the temperature, rainfall, and atmospheric conditions. These two factors, however, are only of secondary importance in horticulture, because in this case the nature of the soil can be more radically altered and the rigours of climate controlled. In horticulture (gardening), we can have "made soils," while the influence of winds and changes of temperature can be mitigated by screen plantation, frame cultivation, and by temperate- and hot-houses.

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tional cropping Some bacteria, however, are obnoxious, for instance, in waterlogged soils denitrifying bacteria are found, which waste nitrogen by converting it into gas. The study of soil bacteria led, in 1900, to the cultivation of *bacillus radicicola*, procurable as a dry powder, which when wanted is diluted in water at a temperature of 75° to 80° F., in which seeds may be soaked before sowing, or the solution may be used as a fertiliser, spread on the land, or used for watering plants. It has had marked results in horticulture. Besides this soil inoculation, soil fumigation is practised in gardening to destroy noxious insects (wireworms, earwigs) and grubs. Disulphide of carbon, vaporite, fumite, apterite and other compounds are used for this purpose.

*Rotation of Crops* From remote times it has been the custom to change the kind of crops grown on a plot yearly, or at longer-spaced intervals. The common Roman practice was to alternate wheat with green crops and fallow, it was observed that if one crop was grown too long the land grew "sick."

This "sickness" is due partly to the exhaustion of the soil, the soluble food needed for the particular plant being all removed or too far reduced, in some cases also it is due to positive fouling. Leguminous plants actually extract nitrogen from the air and store it in the soil. Other plants through root action increase solubility. With high cultivation there is also the advantage of varying cultural operations (sub-soiling, ploughing, harrowing, hoeing) and controlled manuring. Although it has been proved that rotation is not absolutely necessary with scientific high farming, it undoubtedly has advantages, and is beneficial in market-gardening. In the highest form of gardening intensive cultivation is the rule, one crop quickly following another, and in some cases two being grown together, so that rotation cropping is the normal routine.

*Bare Fallowing* is usually undertaken to clean land of weeds or to allow the process of nitrification in the soil to enrich the land, but it is an expensive procedure, because of the loss of a season's crops and the cost of labour. It is usually followed by winter wheat.

*Manures* These are dealt with in a separate article.

*Field Crops* In England the old Norfolk system of taking in rotation roots or potatoes, barley or oats, clover or grasses, then wheat, has been modified. Six- and eight-course rotations are practised in different parts of the country, while much land, sometimes quite unsuitable, is being laid down to pasture. A change, however, is noticeable, owing to the increasing demand for what may be termed industrial crops, in East Anglia at first, and later in other districts, beets began to be grown for the sugar-beet factories, and now huge quantities of vegetables and fruit, particularly peas, beans, strawberries and raspberries, are grown for the British canning industries.

*Fruit, Orchard, and Field Fruit* growing is one of the most profitable forms of farming. Orchards are not equally profitable in every district, much depending on soil and climate. Orchards require to be well drained, deep-soiled, and protected from winds. They should be regularly planted with choice varieties appropriate for the general market, preserving, or, as with apples, for cider making. Dwarf or semi-dwarf varieties are most suitable for general purposes, being easier to prune, spray, and crop, and usually giving a bigger yield per acre. They are, however, shorter-lived, and are not so suitable for catch crops (bush fruit, or flower growing). Perhaps dwarf trees are best for dessert fruit, while taller trees, particularly plums and apples, do well for the preserve factories and cider mills.

The tendency is to have orchards devoted to a single kind of fruit, which has certain advantages, though mixed



Great Britain, divisible into the long-wool, short-wool, and mountain breeds. The lambing season for the short-wool (Dorset) breeds is January; the long-wool and mountain lambs come later (February to April). Ewes and lambs are kept on the lambing ground for about a fortnight, the ewes being given some cake. They can then be turned to grass. Tail docking is carried out at a month old and castration of the young lambs follows soon after. At about the 10th or 12th week the lambs are separated from the ewes. Shearing is carried on from the middle of May to the end of July.

**Pigs** on a mixed farm, especially where butter or cheese is made, cost little to keep, as they consume and grow fat on much that would otherwise be wasted. When there are only a few they may be kept in sties. Where a number of pigs are kept, it is better to house them in well-littered sheds round a thoroughly drained fold-yard, and put them to graze for at least part of the time. When grazing they will require little more than a pail of swill, supplemented with a mangold or two, a little lucerne, vetches, or cow cabbage. Sows in pig require in addition a pail, night and morning, of long bran and offals, but not barley-meal or maize. These latter are good for fattening pigs for market. Of the many breeds, the large and middle whites, large blacks, Berkshires and Tamworths are preferred, though breed, size, and age will depend upon whether they are required for pork or the bacon factory. The present trend is for medium-sized pigs and small joints.

**Poultry** on the mixed farm will usually be kept for both eggs and table, and allowed to run about the straw-yards, folds, and orchards. In the orchard they do much useful work by keeping down insect pests, when they require little extra feed except kitchen refuse, a little maize, and cereal offals. It is not an economical system, however, and where a serious profit is expected greater care is

needed, which leads to specialised poultry farming.

**Bees** on a farm yield but a small return in honey and wax, but are nevertheless indispensable to agriculture and horticulture, as fruit, flowers, and many vegetables are practically dependent on bees for fertilisation. A few hives entail little attention or cost for upkeep, as the flowers in the gardens, orchard, fields, and hedgerows will provide all the nectar the bees need.

**Implements** Digging, multiple-furrow, and sub-soiling ploughs are made for horse and motor traction, the latter steadily gaining in favour. Cultivators or scuffles have from 5 to 11 tines adjustable, and having a cutting and lifting action. Modern harrows have curved tines at the back. Drills have replaced broadcasting, both for seed and fertilisers, they are made in many patterns, from the scuffle drill with fixed coulters to those with endless screws and revolving brushes.

**Organisation** In 1777 the Bath and West Counties Society was founded at Bath to encourage agricultural arts, manufactures, and commerce within the W. Counties. In 1869 it absorbed the Southern Counties Agricultural Association, and later extended its activities to Wales. It maintains a staff of experts, and holds an annual show in different districts, as well as undertaking research and maintaining a dairy school. The Smithfield Club was founded in 1798 with the object of improving live stock, and it has since held in London the important annual Fat-Stock Winter Show. The Royal Agricultural Society of England followed in 1838, it has a club-house in Hanover Square, London, controls an experimental farm at Woburn, Bedfordshire, publishes a Journal and organises annual agricultural shows in different parts of England. This led to the formation of the Farmers' Club, with headquarters in London, and also to a number of local farmers' clubs, agricultural associations, and chambers of agriculture.

The Central Chamber of Agriculture also with headquarters in London was founded in 1865 and has hundreds of affiliated chambers all over the country. Other organisations are the Royal Counties Agricultural Society (1861) the National Farmers Union (1903) with numerous affiliated county unions the British Dairy Farmers Association (1879) Central Land Association (1907) National Pig Breeders Association National Poultry Organisation Society (1893) etc with other associations devoted to special breeds.

In Scotland there are the Highland and Agricultural Society (1784) and the Scottish Agricultural Organisation Society (1906) in Ireland the Royal Dublin Society (1731) and the Irish Agricultural Organisation Society (1894).

**Education** Denmark was the pioneer in agricultural education establishing a Veterinary College at Copenhagen in 1773 which soon became the Royal Veterinary and Agricultural College. Edinburgh followed in 1790 by establishing a Chair of Agriculture at the University. A Chair of Rural Economy was founded at Oxford in 1796 and a School of Rural Economy when the Indian Forestry School at Cooper's Hill was transferred to Oxford. At Cambridge the Agricultural Department is extensive with a school farm at Gravel Hill and an experimental farm in Norfolk. Information as to the innumerable agricultural schools and institutions which now exist may be obtained from the Ministry of Agriculture and Fisheries Whitehall S.W.1.

**Agriculture and Fisheries, Ministry**  
of created in 1889 It took over  
the duties of the Privy Council in  
regard to agriculture and the spreading  
of contagious diseases among animals  
and the powers of the Land Com-  
missioners in regard to the commuta-  
tion of title the enfranchisement of  
copyhold the enclosure of commons,  
and a                over the property  
of                estates In 1903

it took over from the Board of Trade its duties in respect of the fishing industry. A Board of Agriculture for Scotland was established in 1919.

**Agriantum** (now **Agrieno**) till recently **Cruta Creek Akasta** town on S.E. coast of Sicily. A centre of sulphur mining. Formerly of great importance. It declined gradually after its capture by the Carthaginians in 405 B.C. Conquered by Rome 210 B.C. and has many Roman antiquities. Pop. c. 24,000.

**Agrimony** a garden perennial plant with spikes of large sweetly scented yellow flowers 2 ft high produced in Jun and July. Ordinary garden soil in 1 culture.

**Agrippa, Herod I** (10 B C - A D 44)  
king of Judaea friendly to Judaism  
His son Herod Agrippa II ( 7-100)  
heard St Paul at Caesarea (Acts xxvi)

**Agrippa, Marcus Vipsanius (63-12 B.C.)** Roman statesman and general of humble origin became the friend of Octavian and commander of the fleets that conquered Pompey at Myle and Antony and Cleopatra at Actium.

**Agrippa, Menenius, Roman consul**  
who conquered the Sabines and  
Samnites during the second half of the  
6th cent BC and was perhaps the  
original author of the parable of the  
Belly and the Members—see *1 Peter*  
appears *Cori 1/10/15*

Agrippina the Younger (15-58)  
mother of Nero poisoned her first  
and third husbands to get the  
crown for her son by whom she  
eventually killed

Agropyrum, the ~~Agropyrum repens~~ <sup>Agropyrum repens</sup> is a type

Agrosterama (The Crested Ibis)  
Poses of Heaven! Lush green and  
annual plants with red and yellow  
flowers

*Agrostes* (*L.*) *Poaceae*.  
An ornamental grass used in gardens.  
Besides several species of *Agrostis*,  
*Agrostis* *perennis* is also grown  
and *Agrostis* *perennis* is also  
used in garden.



**Aguascalientes** (1) State of Central Mexico entirely inland, watered by Rio Grande (or Aguascalientes), and connected by rail with the port of Tampico on Gulf of Mexico. An agricultural and stock-raising district. (2) Town, capital of the above. An industrial centre of some importance and market for the province. Industries include railway works, textiles, tobacco, tanneries, and some smelting. There are hot medicinal springs in the neighbourhood, hence its name, which means "hot waters." Pop. state 132,500, town 48,100.

**Agulhas** [AGŪŌL'YAS], Cape, the most S promontory of Africa. Agulhas is Portuguese for "the Needles," so called from the sharpness of its rocks. Is very dangerous to navigation, and a lighthouse was built here in 1849.

**Ahmadabad** (1) District in Gujarat Province, Bombay Presidency, India, N of the Gulf of Cambay. It is mainly agricultural, cotton and cereals are the most important crops. (2) Town on Sabarmati R., capital of the district, an important centre of the cotton industry, which employs about one-third of the population, other industries are silk, flour-milling, pottery, metal-working is an important handicraft. Ahmadabad is architecturally one of the most striking cities of India. Jama Masjid is a Hindu temple now used as mosque, there are a modern Jain temple and many handsome mosques. Pop. district c 890,000, town (1931) 314,000.

**Ahmed I**, Sultan of Turkey (1603-1617), waged unsuccessful wars in Hungary and Persia. **Ahmed II**, Sultan of Turkey (1691-5), badly defeated at Slankaman in Hungary (1691). **Ahmed III**, Sultan of Turkey (1703-1736), waged war on Russia, recovered the Morea (1715), and was defeated by Austria (1716 and 1717).

**Ahmed Fuad**, see **FUAD I**.

**Ahmednagar** (1) District of British India, in Bombay Presidency, covering an area of over 6000 sq m, owing to lack of rainfall is not very fertile,

district is watered in N by the Godavari and its affluents. (2) Town, cap. of the above, with growing textile industry, chiefly cottons, some metal working. Pop., district c 730,000, town c 50,000.

**Aidan**, St. (d. 651), a Celtic monk sent in 635 from Iona to convert Northumbria. His saintly nature overcame much opposition, and he was made bishop of Lindisfarne. Feast, Aug 31.

**Aide-de-Camp** [*pron* AD-DŪ-SAHN], a confidential officer attached to the staff of a general, whom he helps with routine work and whose instructions he transmits to other officers.

**Aydın** (*Aydın*) (1) Vilayet of S E Asia Minor in the neighbourhood of Smyrna, well wooded. Before the World War Aydın was a centre of industry, but the Greco-Turkish War of 1919-22 decreased its trade. (2) Town in the vilayet, trade in fruits, cotton, and morocco leather. Pop. vilayet 212,600, town 70,307.

**Aids**, claims of a lord upon a vassal, which by the provisions of Magna Carta could be enforced only for three purposes: (1) to attend his lord in war, (2) to provide ransom for him if taken prisoner, (3) to supply the money for knight-ing his eldest son and marrying his eldest daughter. See also **FEUDALISM**.

**Ailanthus** (*Tree of Heaven*, *Tree of the Gods*), an ornamental tree introduced from China in 1750, with a dark twisted trunk, branching 8 or 9 ft from the ground, the branches bearing long pinnate leaves with big elliptical leaflets. A light rich soil is required, in a sheltered and moist position. The garden species is *Ailanthus glandulosa*, a hardy, deciduous shrub, with small greenish flowers and peculiar red fruits.

**Ailanthus Moth**, a Chinese silk moth, the caterpillar of which feeds on the tree of the same name. See also **BUTTERFLIPS AND MOTHS**.

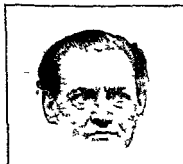
**Aileron** [*pron* A'LYŌN], a hinged flap attached to each end of the main plane of a flying machine, which serves to preserve balance, and is used in turning sharply.

**Alisa Craig**, islet off the Ayrshire coast near the mouth of the Clyde a basaltic rock rising to 1115 ft above sea level surmounted by a light house. The rock is used in the manufacture of curling stones.

**Ain** [Ain] (1) Department of E. France in the Jura between Geneva and Lyons. The district about Bresse is fertile but the S and E of the department are mountainous and pastoral the N is swampy. Products are stock, geese, cheese, cereals, forest industries, vines (Bresse), asphalt (Seysse). The Lyons silk industry has extended to the W towns. Chief town Bourg. Pop. (increasing) 393 000. (2) River, a tributary of the Rhone rising in the Jura mountains and flowing into the main stream above Lyons.

**Alger** Alfred (1836-1904) reader at and Master of the Temple and Canon of Bristol wrote a life of Charles Lamb and edited his works.

**Ainley** Henry Hinchliffe (b 189) actor joined Sir Geo. Alexander and Sir F. R. Benson appearing in London



in 1900. He is one of the best known English actors in both Shakespearean and modern rôles.

**Ainos** (or Ainu) a very ancient race probably of Alpine affinities living in Hokkaido (the northernmost island of Japan). They are probably survivors of the prevalent primeval stock of N. Asia and have not much advanced beyond the civilisation of the Stone Age. Their religion is a primitive Animism. The race is in rapid decline. They are remarkable for the extreme development of hair upon their bodies and are frequently referred to as the hairy Ainu.

**Ain Sefra**, one of the four territories into which S. Algeria has been organised by the French. Pop. 175 600.

**Ainsworth**, William Harrison (1805-1882) writer of historical novels. He entered a London publishing house but abandoned it for novel writing. His best known books include *Jack Sheppard* (1839), *The Tower of London* (1840), *Old St. Paul's* (1841).

**Aintab** (Gaz. Antep) (1) Vilayet in Asiatic Turkey immediately N. of French mandated Syria, a centre of Nationalist resistance to French influence. (2) Town on tributary of the Euphrates in the above of strategic importance in olden times, now manufacturing and missionary centre. Chief products are leather, goats' hair, fabrics and mixed textiles. Besieged and captured in 1901 by French and later returned to Anatolia. Pop. vilayet 15 800, town 40 000.

**Aintree**, a village near Liverpool, Lancs. The Grand National Steeplechase is run annually on the neighbouring race-course.

**Air** the gaseous fluid that surrounds the earth and composes the atmosphere. It is a mixture of several elements and compounds whose relative proportions in air taken from all parts of the globe has been found to be remarkably constant, only small differences being noticeable. The amount of compounds that are present in air (principally carbon dioxide and water) does, however, show some difference.

that in the case of water vapour being considerable

A very large number of analyses of air are available, the following figures give an average composition of dry air freed from carbon dioxide (per cent by volume)

Nitrogen	78.111
Oxygen	20.955
Argon	0.933
Neon	0.0015
Helium	0.0005
Hydrogen	0.0001
Krypton	0.000005
Xenon	0.0000006

The amount of carbon dioxide in air is usually about 0.03 per cent, but in industrial towns it is higher. The moisture content of the air is extremely variable, a representative figure is about 1 per cent.

In addition there are other gases, such as ozone, and oxides of nitrogen (formed by lightning discharges), ammonia (formed by the decomposition of organic matter), and various gases such as carbon monoxide and sulphuretted hydrogen (evolved by industrial processes and in some cases from natural sources such as volcanoes). The amount of these other gaseous constituents, however, is very variable, and, except close to the point of origin, in any case quite negligible.

In addition to the gases present, air always contains more or less solid matter in the form of very fine suspended particles.

Air is of course an essential part of innumerable industrial processes, usually on account of its oxygen content. In engineering compressed air is used to a considerable extent as a method of power transmission (see PNEUMATICS).

Liquid air is now prepared on a large scale, since fractional distillation of this is the most convenient method for isolating commercially pure nitrogen, oxygen, and argon (*qv*) (see ATMOSPHERE).

**Air Compressor,** see COMPRESSED AIR, AIR-PUMP

**Air Council,** the administrative body of the Royal Air Force, consisting of the Secretary and Under-Secretary of State for Air, the Chief of Air Staff, the Air Member for Personnel, the Air Member for Supply and Research, and the Secretary of the Air Ministry.

**Aircraft, History of.** The idea of flying probably dates from the time when mankind first began to observe the world and to realise the possibilities of progress. The legend of Icarus and Icarus, and the Eastern fables of flying horses and carpets certainly go back several hundred years B.C. It was natural that these legends should lead to continued efforts, most of them probably forgotten, to make wings and use them as a bird does. It is characteristic of the modern age that the brothers Lilienthal, in 1861, started experimenting, by night for fear of ridicule, with a view to making bird-like wings for themselves, but Otto soon realised that patient scientific investigation would be necessary, and so became, through his experiments with gliders, one of the true pioneers of aviation, he was killed in a gliding accident in 1896. Leonardo da Vinci, the true father of the modern mechanical age, projected all kinds of machines which have since been realised, but though he was the first to suggest the air-screw, he failed to realise both its association with the lifting plane, and also the fact that man's own muscular power would never succeed in lifting him from the earth.

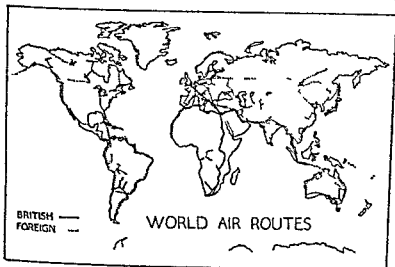
The first suggestion of flight by means of apparatus lighter than air came from De Lana, who in 1670 suggested that a vessel exhausted of air, if itself light enough, would rise in the air. We know to-day that no material exists by means of which this idea could be realised, since the pressure of the air would crush any material known. It is noteworthy that Robert Hooke (the discoverer of Hooke's Law of the Spring) said rather rashly that "God would not suffer such an invention to take effect, by reason of the disturbance it would

cause to the civil government of man.

About the same time the line of attack through gliding began to be realised and experiments in this direction and that of flapping wings probably never ceased. People were always attaching some kind of wings to themselves and jumping off church towers and other elevated points frequently having the luck to escape serious injury. Sir George Cayley (1773-1857) an eminent English mathematician turned his attention

hydrogen balloon at Edinburgh the first human being to navigate the air on British soil. The further development of the balloon for sporting and military purposes will be found described in the articles BALLOON and AIRSHIP.

It is astonishing that after the development of the power-driven aeroplane and the realisation of the impossibility of flying by means of human muscular power we should have at last succeeded in constructing



seriously to the whole problem. He finally rejected the idea of the ornithopter, i.e. of flight by human muscular power through flapping wings and actually suggested that the final solution would come from an explosion engine which for the year 1809 was a remarkable manifestation of prophetic genius.

In the meantime there was the Montgolfier's balloon in 1783, by the first human ascent of Rozier in the same year. In 1793 year Tytler ascended in a

flying gliders which without any expenditure of muscular energy are able to remain aloft under most weather conditions for long periods and even actually to travel at a reasonable speed towards a desired objective. See GLIDERS AND SAIL PLANES.

After Otto Lilienthal's death in 1896 Pilcher in England and Chanute in America continued the work, and though the former lost his life while gliding the efforts of these three rendered fairly clear the general lines

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combination of patient experiment with models quantitative investigation both theoretical and practical and finally practical experience in the air obtained through the glider.

Both S. P. Langley and Hiram Maxim had devoted large sums of money and great labour to a solution and it is now known that Langley's final machine was actually capable of flight. This was not proved during Langley's lifetime owing to a series of unfortunate accidents which led to the abandonment of his experiments. Langley died in 1906 and his machine was successfully flown in 1914. The great development of aircraft in the World War was followed by the institution of commercial air services all over the globe.

These civil air services are efficient and reasonably safe the record of British commercial aviation being as follows:

Period	Jan 1	19	7 Dec	31	1931
Miles flown					6 45 000
Passengers killed and injured					24

Aircraft now exist in a large number of forms designed for special uses from very high-speed machines for military and record breaking purposes exceedingly difficult to handle to the autogiro which can rise and alight within an ordinary back garden and is probably more easy to handle than a motor-car in traffic.

**Aircraft Carrier** a vessel attached to the Navy which acts as floating aerodrome for aircraft engaged in bombing and reconnoitring in co-operation with the Fleet. Flights were made from ordinary warships before the World War and experiments were carried out with converted ships in 1914 and 1915 flying decks and hangars being fitted and wheel trolleys used for seaplane launching. In 1916 three specially designed aircraft carriers of 6 000 tons each were launched. There are two types one with a clear deck and the other the Island type with the funnel and turrets grouped on one

side. In leaving and landing the ship faces the wind and the aeroplane flies towards the bows the speed of the vessel being an added help. Under the Washington Treaty the tonnage of aircraft-carriers was limited as follows: British Empire and U.S.A. 135 000



Aircraft Carrier, E. S.

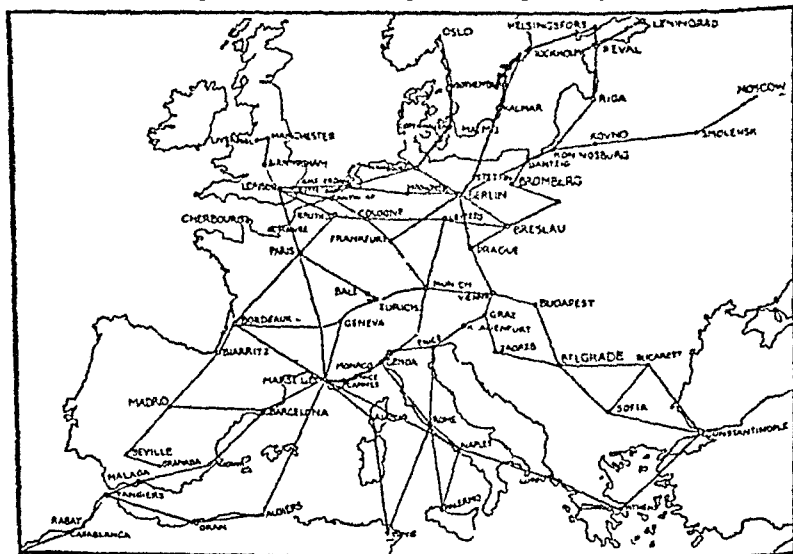
Japan 81 000 France and Italy 60 000. In 1931 the British Empire had 8 aircraft carriers (106 000 tons) the U.S.A. 3 Japan 3 France 1 and Italy 1.

**Air Defences** The vulnerability of countries hitherto protected by sea or mountain frontiers to attack from the air necessitates special forms of defence. Although the air raids carried out on London during the World War were limited and ill-organised and the total casualty list was moderate the moral effect was great. Moreover the closeness of London to the coast gave little time for warning and only 5 per cent of the raiding machines were brought down. Defence in the War was planned by concentric rings alternately covered by guns and patrolled by defensive aeroplanes with an inner balloon apron. In spite of the development of anti-aircraft barrage it is possible for raiding planes to fly above the gun range so that the chief defence appears to be intensive counter attack by defending planes before the raiding force enters the country. At the present time the technique of air attack is enormously in advance of defence. There is a special command of the R.A.F. devoted to Air Defence.

upon which a plane capable of gliding under control should be built

The brothers Wilbur and Orville Wright took up this problem about 1878, though their active interest dated from 1896. In 1900 they constructed a biplane glider, and set to work systematically to learn how to control such a machine in the air. They had the advantage of Chanute's personal interest and advice. They went into the whole problem mathematically,

first flight lasted only 12 secs., but on the same day they made a flight lasting a minute. After continued progress, which, in spite of the fact that no secret was made by them of what they were doing, received no public interest or recognition, they brought their machine to Europe in 1907, and in 1908 flew for over 2 hours at Le Mans. It should be mentioned that the Englishman Stringfellow had in 1848 produced a perfectly satisfactory model



European Air routes

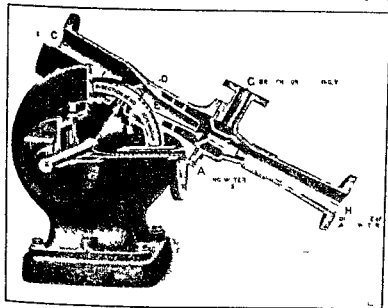
tically, and even constructed, in 1901-2, a wind tunnel in which they created a draught of air by means of a propeller. In this way, in contrast to early experimenters who hoped to carry the position by storm, they succeeded in gaining a thorough understanding of all the necessary conditions for the stability and control of a heavier-than-air machine. It then only remained for them to fit a propeller driven by an internal-combustion motor, and they were able to fly successfully on Dec. 17, 1903. Their

of a propeller-driven aeroplane, the power used being steam. This flew 120 ft., and undoubtedly embodied many of the elements of success. Stringfellow, in 1808, exhibited at the first Aeronautical Exhibition at the Crystal Palace a steam engine which developed 1 horse-power per 10 lb weight, and a triplane which was to be driven by this engine. The design of the triplane was, however, very bad from the aerodynamic point of view, and the model never flew. The world had to wait for the Wright brothers'

SPHERES (90) and his invention of the air pump was the beginning of the scientific study of gases

In the same way the invention of methods of obtaining very high vacua that is to say of exhausting almost the whole of the air from a given space was the essential preliminary to almost the whole of modern physical discovery concerning electricity and atoms

on the various rotary principles employed for liquids (see PUMPS). There are four principal methods by which very high exhaustion is obtained. The first is by the use of mercury which partially fills a drum turning around a horizontal axis and having a peculiar set of channels which cause the air to be trapped on the vacuum side and pushed round towards the fore-pump



Rotary Air pump (Leblanc)

physics. The manufacture of the modern electric lamp and wireless valve would likewise be quite impossible without these pumps. Many of these pumps will not work against the full pressure of the atmosphere and it is necessary to use a so-called fore pump which itself produces as a rule what a few years ago would have been regarded as a high vacuum. Many of these pumps are based upon the ordinary piston principle others

This is the well known Gaede mercury pump

The second principle is that of the molecular pump. This depends upon the fact that the molecules of a gas are continually striking and rebounding from the walls of the vessel in which it is contained (see KINETIC THEORY) and that if such a wall is in rapid motion each molecule on hitting it is given a velocity in the direction in which the wall is moving. In practice this pump



**Aird, Sir John, 1st Bart (1833-1911),** English engineer who supervised the removal of the Crystal Palace from Hyde Park to Sydenham Reservoirs, waterworks, railways, docks all over the world, and the Aswan Dam were also constructed by him

**Airdrie,** town of Lanarkshire, Scotland, about 10 m E of Glasgow Airdrie, with its neighbouring parish, is part of the barony of Monkland, which gives its name to the canal joining Airdrie to Glasgow Iron and coal are found near-by, and there is a manufacture of cottons Pop 25,000

**Aire** Tributary of the Yorkshire Ouse draining the W Riding Rises in the Pennine moors and flows S and E past the industrial district of Leeds to join the main stream near its entrance to the Humber Chief towns Skipton, Keighley, and Leeds

**Air Force, Royal** At the beginning of 1918 the air branches of the Army (the Royal Flying Corps) and of the Navy (the Royal Naval Air Service) were amalgamated into the Royal Air Force under the control of the newly formed Air Ministry, which inherited the work of the joint naval and military Air Boards In peace-time the scope of the Air Ministry is extended to the fostering of civil aviation, while the Royal Air Force is largely used for air defence at home and in distant parts of the Empire, such as the N W Frontier The R A F is controlled by the Air Council (*qv*), and had in 1932 a personnel of 32,000, with c 1500 machines There is an Air Force reserve of approximately 10,000 The Air estimates amounted to £17½ millions for 1932-3

**Air-gun,** gun or rifle in which air under pressure is used to expel a bullet, or sometimes a small dart Although in the past air-guns were elaborated until they became weapons of considerable power, they have now no practical importance except as toys In these, the barrel is connected to one end of a cylindrical chamber, the other end of which is closed by a piston backed by a powerful spring To charge the gun the piston is forced back

against the spring and held by the trigger, the bullet being placed in position in the barrel When the trigger is pulled the piston is released and compresses the air in the cylinder, thus forcing out the bullet

**Air-lock** (1) Obstruction caused by the presence of air in a pipe conveying liquid under low pressure. In order that an air-lock may be effective, the pipe must be bent in such a way that a hydrostatic difference of level greater than the pressure available in the pipe can be built up (2) Intermediate chamber between a high-pressure air works (*e g* tunnel, caisson) and the outer atmosphere, enabling persons to be passed from one to the other without release of high pressure, just as ships are passed from low level to high level in a canal

**Air Mail,** *see* AIR TRANSPORT

**Air Ministry,** formed in Oct 1917 during the World War to control the R A F, through the Air Council The latter is composed of the Secretary of State for Air, the Under-Secretary of State for Air, the Chief of the Air Staff, the Air Member for Personnel, the Air Member for Supply and Research, and the Secretary of the Air Ministry Under each member is a department concerned with his particular duties There are four area commands in England—Southern, Midland, Northern, and Coastal—and five abroad—Iraq, India, Mediterranean, Palestine and Middle East The Secretary of State's Department also controls civil aviation and the Meteorological Office The Air Ministry offices are in Kingsway, London, W C

**Air Plants.** These plants (epiphytes) grow on trees or on other plants without taking any food from them or from the soil Their roots grow out into the air and absorb moisture from it, often becoming green Most orchids are air plants

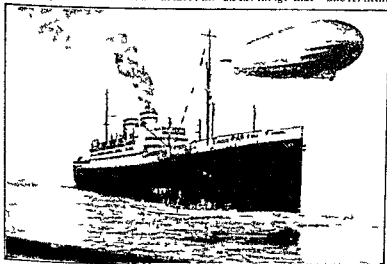
**Air-pump.** Until recently all air-pumps were based on the same piston principle as the water-pump Guericke's spectacular experiment, known as the MAGDEBURG HEMI-

days later by J A C Charles. Nevertheless the first really successful attempt of the kind was not made until 1851 when Giffard made a successful flight in which a speed of 4 to 5 m per hour was obtained.

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takes the form of a bronze cylinder with a number of circular grooves in it rotating with very little clearance in the casing. Into the grooves fits a fixed comb with a very small clearance, the inlet for gas being on one side of the comb and the outlet on the other. This pump works at an enormous speed. The pump described was also invented by Giede, another form of it is due to Holweck.

The third method of obtaining high exhaustion is known as the diffusion or condensation pump. This depends essentially upon the fact that mercury has a very low vapour pressure when cold, while it can readily be boiled in a vacuum. The vessel to be exhausted is joined to a space into which mercury vapour is flowing, and in which it is condensing, another outlet from this space being joined to the fore-pump. The space to be evacuated is thus in contact with the space filled with mercury vapour of almost perfect purity into which the gas to be removed diffuses. These pumps are exceedingly simple to make and are also extremely effective.

The fourth method of obtaining very low pressures is the use of charcoal cooled to an extremely low temperature. This method, which was very important until the invention of the modern air-pump, is now only used in special cases.

**Air Raids** (see also AIR DEFENCES) The first German bomb fell on British soil on Dec 24, 1914, and in Jan 1915 two airships bombed Yarmouth and Cromer. In April the L9 made an extensive but not very effective tour over the N and E of England, and in May the first raider reached London, killing 5 people, injuring 14. Heavy damage and large casualties were inflicted in the last months of 1915, and mass-raiding became common. On Sept 23, 1916, eleven airships raided the S Counties, 2 being brought down, after inflicting 40 casualties. By the end of 1916 the defence had mastered the lighter-than-air raiders, and in 1917, concentrated aeroplane bombing

was begun. After heavy casualties at Folkestone and Shorncliffe in May London was attacked on June 13, and again on July 7, 150 people being killed, 550 injured, and damage done to the value of several hundred thousand pounds. In Sept., night attacks were begun with moderate success, and in the spring of 1918 giant aeroplanes were reintroduced, Zeppelins being again employed between March and Aug. Two hundred aeroplanes were stationed at home for defence. In all nearly 9000 bombs were dropped on Great Britain, killing 1316, and wounding about 3000 persons.

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### Air Records

**Speed** 682 km per hour (423 m.p.h.) Francesca Ajello (Italy), April 10, 1933, in a Hydravion MC72 Fiat AS6.

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**Altitude (aeroplane)** 13,404 metres (43,976 ft) Captain C F Owens (Great Britain), Sept 16, 1932, in a Vickers "Vespa," Bristol "Pegasus" engine S 3.

**Long Distance in a Direct Line** 8544 km (5309 m) Squadron Leader O R Gayford, D.F.C., A.F.C., and Flight-Lieutenant G E Nicholletts, A.I.C., Feb 6-8, 1933, Cranwell-Wallis Bay, S Africa Fairey Monoplane. This was beaten on Aug 5-6, 1933, by MM Codos and Rossi, who flew in a Blériot monoplane 5650 m from New York to Rayak (Syria) in 54 hrs. See also FLIGHTS, LONG-DISTANCE.

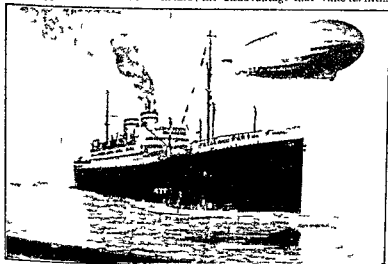
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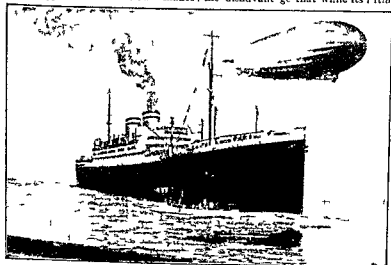
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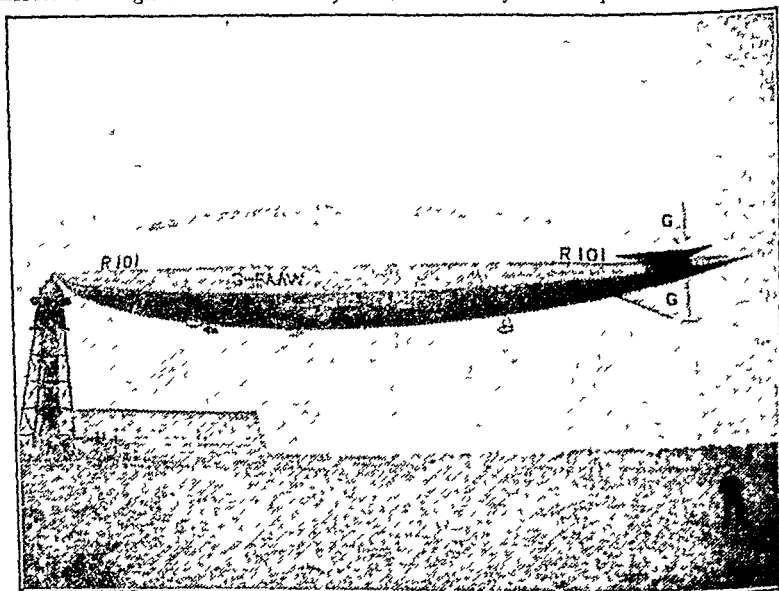
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fatality, and that the *Graf Zeppelin* has an equally good record of safety. On the other hand disaster has pursued both England and America. Two English-built air-ships, the R 34 and the R 100, have crossed the Atlantic, but the R 38 went up in flames on her second trial flight in 1921, and the R 101 was wrecked in France on her first long-distance flight in 1930. Errors in design were undoubtedly the

travel than aeroplanes, and that if they can be made sufficiently safe, they are likely to be employed for long-distance luxury travel. Their disadvantage is their high operating cost: it is said that the *Graf Zeppelin* costs approximately £1,000 per day to run, carrying a crew of 40 and about 20 passengers. It is certain that much greater skill is required to handle such a ship safely than to fly an aeroplane.



R 101 at its mooring mast, Cardington Beds

cause of these disasters, the latter of which was foretold in a book *Gentlemen Prefer Aeroplanes*, published two years previously.

A more recent disaster is that to the United States air-ship *Akron*, which appears to have been struck by lightning. It is generally thought that rigid air-ships, owing to the fact that they are constructed of metal, are in very little danger of damage from this cause.

There can be no doubt that air-ships are a much more comfortable means of

**Air Transport.** At the conclusion of the World War, the enormous experience gained in military aviation was put at the service of commercial transport. In August 1919 a regular service between London and Paris was inaugurated, and by the beginning of 1920 five companies were operating on this route, carrying both passengers and mails. In that year 6,000 passengers and 137 tons of freight were carried by the British lines. In 1924, the British lines were amalga-

# Air

# Air

ymatred into Imperial Airways Ltd  
and granted a subsidy of £1 000 000  
spread over a period of ten years to  
be paid in proportion to the number  
of horse power miles flown. This  
encouraged the introduction of modern  
high power aircraft and the company  
moved steadily towards a self support  
ing position in the ensuing years.  
Various routes from London to the

tons of mails were carried and 600 000  
m flown.

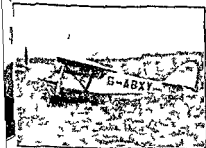
A similar advance in civil aviation  
was also witnessed in other countries.  
In France several air lines have been  
heavily subsidised and as early as  
1919 a successful route was established  
between Toulouse and the French N  
African possessions in Morocco. This  
service was extended across the S



Imperial Airways G-AAGX



The 1111



Milmon & Hfa 1 & Cont 1



I terio Heracle

Continent were operated and in 1906 a  
service between Egypt and the Persian  
Gulf was begun. This was extended  
into a weekly service between London  
and India in 1909. In January 1931  
a regular route to Central Africa was  
opened and was extended to the  
Cape in the following year. In 1931 2  
Imperial Airways carried 35 000  
passengers on regular routes while  
in 1931 670 tons of freight and 121

Atlantic to Rio de Janeiro and Buenos  
Aires in 1907 the intervening sea  
passage being made at first by fast  
steam r. France also realised the  
importance of air transport in com-  
munication with her colonies and in  
1931 a service was opened betw en  
Paris and Saigon in Fr Cochun China  
a distance of 7500 m which is  
covered in 8 days.

Germany debarred from develop



ing overseas routes, concentrated first on internal air services and then on developments in Central and E Europe and the Middle and Far East. A subsidy was offered on a kilometric basis, and in 1926 two powerful companies were amalgamated into the Deutsche Luft-Hansa now the largest air transport organisation in the world. It operated in 1931 nearly 18,000 m of route carried 100,000 passengers, 2,000 tons of freight, and 400 tons of mail. German enterprise has also been successful in opening up services in many foreign countries, notably China, Persia, Colombia, Bolivia, and Brazil. Perhaps the most ambitious route organised was that between Berlin and Shanghai, which was operated for a short time in the summer of 1931, but suspended owing to the disturbed political conditions in the Far East. Germany also has carried out a successful Zeppelin service with S America.

A Dutch line operates between Amsterdam and the Dutch E Indies, and many other European countries, notably Belgium and Italy, have their own State-subsidised air-lines. Russia has also organised an extensive air-net, which is of especial importance in a country of such vast distances.

In the United States, the Government from the first refused any subsidy to private commercial air-lines, but several efficient mail routes were early operated by the Post Office. In 1925, the Postmaster-General was empowered to make contracts for the carriage of mails by air, and in 1926 air navigation came under Federal control. Development was rapid under this arrangement, and in 1931 50,000 m of route were operated and half a million passengers, 500 tons of goods, and 4,000 tons of mails were carried. An annual loss of £3,000,000 is borne by the State.

**Economics.** Air transport possesses the great advantage of speed over all other forms of transport, subject, however, to the loss of time in reaching and leaving an airport. At present

100 m an hour can be economically flown, but an increase in speed above that figure is followed by a disproportionate increase in running costs. The possibility of unbroken journeys across land and sea, mountains, lakes, and frontiers also avoids considerable unloading and transshipment. On the other hand, air transport is handicapped by the small carrying capacity of the unit, and by extremely heavy running costs.

In planning an air-line there is no permanent-way to be constructed, but the route must be carefully surveyed and well-equipped aerodromes, repair shops, hangars, wireless, and meteorological stations, flood-lighting, etc. together with a considerable ground staff, must be provided at regular intervals. The cost of such organisation remains much the same whether the traffic is large or small, and intensive use is therefore economical and tends to reduce fares and freight charges. Ground organisation is one of the most important factors, and efficiency plays a large part in regularity of service, which is as high as 98 per cent on British Continental routes in summer flying. Highly developed ground organisation also makes possible night-flying, which has been extensively developed in the United States.

It has been mentioned that running costs are high, but improvements in engine construction and design have been successful in reducing these from 4s. 2d per ton-mile in 1922 to about 1s 6d per ton-mile at the present time.

**Airy, Sir George Biddell** (1801-1881), Astronomer Royal (1835-81), Professor of Mathematics and Astronomy, signed instruments, initiated Meteorological Department at Greenwich, and published many astronomical works.

**Aisle** [*pron* Il], in architecture, side division of a building, especially church, separated from the main building (e.g. nave) by an arcade or colonnade, the roof, in Romanesque and Gothic churches (except C

*H'ankirchen*) is lower than the main roof. Aisles are normally symmetrical, there is one aisle (occasionally two) as at Hendl Parish Church) on each side of the nave transept or choir. Gangway between two rows of seats in a church theatre etc.

**Aisne** (1) Department of N.E. France between the valley of the middle Seine (departments of Oise and Seine-et-Marne) and the Argonne. It is well forested, rather flat with isolated ridges (e.g. Chemin des Dames). Farming, especially dairying, is very prosperous. The district has local textile industries and quarrying is carried on in the hills. Chief towns: Laon (capital, once the capital of the kingdom of the W. Franks) Hirson, Château-Thierry, Soissons, St. Quentin, Vervins and Guise. Aisne has considerable historical and archaeological interest and suffered severely in the war of 1914-18. Pop. (1931) 489,369. (2) River which rises S.E. of the Argonne in the Meuse department and flows first N. and then E. across the department of the Aisne to join the Oise near Compiègne, length c. 100 m. navigable beyond Soissons as far as Condé.

**Aisne** First Battle of the (Sept. 12-18, 1914). After the German defeat at the Marne (q.v.) their right wing reformed on the N. bank of the river Aisne. The Allies were able to cross the river after fierce fighting but they could not carry the Craonne escarpment. The two armies then dug themselves in and there began the long period of trench warfare diversified at first by the Race to the Sea. (see WORLD WAR)

**Aisne** Second Battle of the (May 7th 1918) a phase of the German offensive of 1918. Its object was to penetrate the allied lines S. towards the Marne and Rheims and crush the Allied forces before American reserves could help. It partially succeeded. The Allies are driven back and at one time it looked as though the Germans might have been successful. Their advance was

checked at the Marne however by reinforcements composed in part of American troops.

**Aix** (1) Town in S.E. France in department of Bouches-du-Rhône. A Roman colony was founded here in 100 B.C. Aix was formerly capital of Provence and is the seat of an archbishop and a university. Pop. c. 100,000. (2) Island near mouth of the Charente (France). Napoleon surrendered here to the British ship *Bellerophon* in 1815.

**Aix la Chapelle** see AACHEN  
**Aix la Chapelle Conference of 1818** The first congress of the Great Powers held under the provision of the Treaty of Paris 1814 which arranged for periodic meetings for the discussion of international questions. At this conference it was decided that as France had fulfilled her obligations under the Congress of Vienna, the army of occupation should evacuate her territory, that she should be admitted into the Quintuple Alliance (q.v.) and invited to their future conferences.

**Aix la Chapelle, Treaty of**, signed in 1818 between England, France, Austria, Spain and Holland. Ended the War of the Austrian Succession. Its main provisions included the return of conquered territory, the expulsion of the Pretender from France, Maria Theresa's consort's recognition as Emperor, the grant of Silesia to Prussia and the renewal of the Vienna Treaty (q.v.).

**Aix les Bains**, town and spa near Chambéry, department Savoie, S.E. France. Its springs were known to the Romans. It is a winter sports centre. Pop. c. 8000.

**Ajaccio**, capital of the island of Corsica situated on the W. coast on the gulf of the same name. Exports figs, wine, timber and olive oil, winter resort. The birthplace of Napoleon Bonaparte. Pop. c. 10,000.

**Ajanta**, a village in the Nizam's Dominions, India, contains the remains of settlements of Buddhist monks in the neighbouring caves; some caves have remarkable wall

paintings, showing traces of the infiltration of Greek art into India as a result of Alexander's conquests.

**Ajax**, name of two Greek heroes (1) **AJAX THE GREAT**, renowned in the Trojan war for his contest with Hector, committed suicide after failing to gain the armour of Achilles. He was the son of Telamon, King of Salamis. (2) **AJAX THE LESS**, boastful son of King Odysseus of Locris, famous for speed in running, was wrecked when returning home after the sack of Troy.

**Ajmere** (*Ajmur*), town in British India, capital of the small province of Ajmere Merwara in Rajputana. A hill town in the Aravalli Range, dominated by the Taragarh Fort. Manufactures oil, etc. Trade in salt, opium, and cotton. A railway centre. Pop 119,600.

**Ajmere-Merwara**, a small subsidiary province of Rajputana, British India. Produces cereals, cotton, and oil seeds. Area, 2711 sq m, pop 560,300.

**Ajuga** (*Bugle*), blue-flowered perennial creeping plants, valuable for carpeting the rock-garden, some with bronze or variegated leaves. *Ajuga reptans* is a common wild plant.

**Akbar**, Jellaladin Mohammed (1542-1605), the greatest Mogul emperor, who, with his minister, Abul Fazl, ruled wisely over N India, showing some interest in Christianity and helping forward education and literature. His enlightened reign (from 1556) began a new religious and literary era in India. He attempted to found a new creed, based on a synthesis of Christianity, Islam, and Indian beliefs.

**Akebia**, climbing hardy shrub of E habitat, much used in gardens. *Akebia quinata* is the best known, and is evergreen, while *A lobata* (*trifoliata*) is deciduous. Both plants have elegant foliage, brown-red flowers, and cylindrical berries. Suitable for pergolas, and climbing about 10 ft.

**A Kempis**, Thomas (c. 1379-1471), Augustinian canon and devotional writer. In 1406 he took the vows in the convent of Mount St Agnes, Zwolle, where he remained in seclusion until his

death. Of his works the best known and most valuable is the *Imitatio Christi*. The simplicity of the faith and the beauty of the style and rhythm of this book have made it famous and widely read. There are many English translations, it has been said to be, after the Bible, the world's "best seller".

**Akenside**, Mark (1721-1770), physician and poet, known both for medical treatises and didactic poetry. His best-known work is *Pleasures of the Imagination* (1741).

**Akhenaten** (*Ikhmaton*), Amenophis IV, (d 1350 B.C.), King of Egypt, a fanatic who abolished the worship of all gods except Aton, the sun-god. Through his neglect of State affairs Egypt lost Syria.

**Ak-Hissar**, town in Asia Minor, c. 60 m NE of Smyrna. Anciently called Thyateira, under which name it is mentioned in the Apocalypse as one of the Seven Churches of Asia. Exports dyes, drugs, cotton, and cereals; connected with Smyrna by rail. Pop c 48,000.

**Akiba ben Joseph** (fl A.D. 120), famous Jewish teacher, began the collection of the *Mishna* (part of the Talmud). He was executed by the Romans in 135.

**Akkerman**, see CETATEA ALBA.

**Akmolinsk** (1) A province of Soviet Central Asia in the Kazak A.S.S.R., S.W. Siberia, situated S.W. of the Irtysh River on the Kirghiz steppes. The province is mainly mountain and desert. The pop is largely nomadic, but coal, gold, and copper are mined in the mountainous centre of Akmolinsk, and the valleys of the system are agricultural. (2) Capital of above province c 300 m S.W. of Omsk. A centre of caravan trade. Pop., province c 288,000, town c 10,000.

**Akola** (1) District in the Hyderabad Assigned Districts (Berar), Central Provinces, Central India, a rich, cotton-growing black-soil area, watered by the Purna, tributary of the Tapti. It produces also millet, the staple cereal of the people. Area 4000 sq m.

300 000 (a) Chief town of the  
330 m. l. of Bombay is a  
manufacturing centre and  
a raw cotton Pop c 35 000  
1, town in Ohio U.S.A. c 30  
of Cleveland An industrial  
rubber manufactures textiles  
and corn mills extensive clay  
the vicinity university Pop  
1,5 000

for Sergei Timof'yevich (1791-  
Russian author an ardent  
ruler and friend of Gogol who  
responsible for his adopting a  
career His novels are highly  
valued in Russia

m. or Axum, ancient sacred  
Abyssinia situated in the N in  
division Pop c 5000

b (1) District in Lower  
British India Coast plain is  
watered and very fertile a great  
growing district Ceded to Britain  
after the first Burmese War  
and port of the above at the  
mouth of the Koldaiting Lemyn  
yn Rs In 1878 Akyab was  
fishing village but grew under  
British rule into the third port of

Chief export rice Pop  
c 500 000 town c 38 000

Alabama ("Cotton State") state  
U.S.A. situated in the S of the  
Gulf between Mississippi on the  
W and the Gulf of Mexico and  
on the S The coast borders  
sandy plain and there is only  
one harbour Mobile Bay The  
Apalachian mountain chain extends  
to the N.E. of the State between  
mountains and the sandy coast  
is the rich black-soil lowland  
forms one of the richest cotton  
growing areas in the world Alabama  
crossed by the Tennessee Alabama  
Mobile Rs Area 51 998 sq m

Alabama is predominately  
agricultural and cotton is the  
chief crop cereals potatoes tobacco  
are cultivated the  
state is well timbered  
in the Appalachians  
cement, and clays

There is a developing iron and steel  
and cotton manufacture.

Population Alabama has a grow-  
ing population chiefly centred on the  
cotton fields with a large negro section  
derived from emancipated slaves  
The coloured element amounts to over  
35 per cent of the population and has  
since the Civil War occasioned an  
acute racial problem The chief towns  
are Birmingham (306 8) Mobile  
(64 0) Montgomery the State  
capital (68 079) Total pop (1930)  
600 000 of whom 245 000 were  
negroes

Alabama, a privateer known also  
as No 20 fitted out in England  
in 1861 to prey upon the commerce of  
the Federal States during the American  
Civil War She destroyed property to  
the value of \$4 000 000 By the  
Geneva Convention Great Britain was  
obliged to pay nearly £3 200 000 to the  
United States as compensation

Alabamine (chem) the suggested  
name for the halogen element of  
atomic number 85 which has not as yet  
been isolated Some workers in  
Alabama claim to have identified it  
by magneto-optic methods in material  
examined by them and have suggested  
for it this name which must be re-  
garded as purely tentative until  
confirmation or disproof of their work  
is available

Alabaster a fine-grained non-  
crystalline form of gypsum (q.v.)  
Used for manufacturing ornaments and  
other indoor objects because of its  
great softness which renders carving  
easy Since however it readily dis-  
solves in water it is unsuitable for  
outdoor purposes It is extensively  
worked in Tuscany and in the  
Midlands of England The substance  
variously known as Oriental alabaster  
and ancient alabaster is of a cal-  
careous nature It was used for ancient  
Egyptian carvings

Alagôas state of E. Brazil on the  
Atlantic coast between Pernambuco  
and the R. Sergipe The area is  
over 20 000 sq m. the soil is fertile  
but agriculture is hindered by the very

unhealthy climate Capital is now Macero, formerly Alagôas Products are rubber cotton, sugar, and tobacco Pop (est 1929) 1,190,000

**Alajuela**, (1) Province in the republic of Costa Rica, producing sugar and coffee (2) Town, capital of the above Pop., province 97 690, town 9400

**Alamanni**, a confederacy of several central German tribes formed in the 2nd cent A.D. They were continually at war with the Romans and were only defeated in 496 by Clovis, King of the Salian Franks after the downfall of the W. Roman Empire

**Åland Islands** Archipelago extending from N coast of Gulf of Finland across mouth of Gulf of Bothnia to point c 30 m from Swedish coast. They number c 300, many very small and uninhabited, c 80 are inhabited Åland is the largest island situated near Swedish coast capital Mariehamn home port of most of the great sailing ships still afloat The islands are a department of the Finnish Republic, with local self-government secured to them by the League of Nations (1920). Russia obtained the islands in 1809 from Sweden, after the 1917 Revolution they were inclined to return to Sweden The islands were demilitarized by a convention of the Baltic Powers in 1922 Area 551 sq m pop (1939) 27,460

**Alaric I** (d 410), chief of the Visigoths in the late 4th cent. he invaded Greece (396) and Italy (409) finally taking and sacking Rome in 410

**Alaric II**, king of the Visigoths (484-507); Clovis king of the Franks attacked, defeated, and killed him in 507

**Alashan** (1) Province of Mongolia, except border the Little Gobi Desert the S. part of the desert of Gobi. Very thinly populated, most of the province a saline and sandy waste Pop. c 200,000 (2) A dry mountain range with a general trend N.E. to S.W. between Hameln and Hsichan rivers in Inner Mongolia Highest summit Hsichan

**Alaska** occupies the N.W. extremity of the N. American continent It was purchased by U.S.A. from Russia in 1867, and by an act of Congress was constituted a territory of U.S.A. (1912) The territory is bounded on the N and N.W. by the Arctic Ocean, Bering Strait and Behring Sea divide it from Asia (to which Alaska is joined by a submarine plateau) to the W.; the boundary on the S is the Pacific Ocean The land frontier between Alaska and Canada is partly arbitrary, and follows the meridian of 141° W. for a considerable part of its length, from



Alaska Native Dancers

near Mount St. Elias the frontier marches with the W. mountains to the inlet called Dixon Entrance

The peninsula of Alaska is formed by the N.W. extremity of the mountain spine of W. America, which is here sharply twisted towards the W. The S. and S.W. coasts have been depressed and submerged in the same manner as the W. coasts of Scotland and Norway. These coasts are deeply indented and fringed by islands, of which the Aleutian Islands, the Alexander Archipelago, and the Kodiak Islands are the largest groups, all of them are fragments of a submerged mainland. The Arctic coasts are much more elevated. The interior consists of a plateau with

flanking mountain systems. The S mountains are lofty and include over a dozen active volcanoes: the St Elias Range and the Alaska Range continue the coast ranges of Canada and include Mount St Elias (18 000 ft), Mount Ioraker (17 000 ft) and Mount McKinley (over 20 000 ft) the highest summits in N America. The N mountains are much lower and less defined as ranges. The principal river is the Yukon (qv) which drains the great plateau and falls into the Behring Sea.

**Climate.** The climate is extreme on the plateau but more temperate on the Pacific coast and sub Arctic in the N. Severe cold is experienced in the winter with heavy precipitation and the summer months are very brief.

**Flora and Fauna.** The flora of a large area is that characteristic of Alpine and tundra regions. There are large forests of cedars and conifers along the Pacific coast: the chief forests of the interior are about the river valleys and consist chiefly of spruce. Vegetation becomes stunted towards the Arctic coast. Fur bearing animals: seals, caribou, reindeer etc. such as are found in the sub-Arctic regions of N America in general are common in Alaska. Mosquitoes are a prevalent pest in summer.

**Minerals.** The discovery of gold in the Klondike district of the Yukon first attracted attention to Alaska. There were successive stampedes of prospectors at the close of the 19th cent. Coal, copper, quicksilver and tin are also known to exist but lack of transport is a serious handicap to exploitation.

**Population.** The pop. is almost evenly divided between whites and Indians or Eskimos. The chief occupations are fishing (salmon) and mining. Hides, pelts and lumber are exported. Chief towns are mining settlements: Juneau (capital), Sitka, and Douglas. Skagway is the port for the mining regions with rail communication to the interior. Area over 1 m pop. 59,278.

**Ala Tau** series of mountain range in W Central Asia lying S.E. of the Balkash separated by the basin of the Ili from the Tianshan Mountains. The Ala Taulink the Tianshan to mountain of W Mongolia. Highest summit: Khan Tengri (4 000 ft).

**Alava**, province in the Basque country of Spain. The W Pyrenees and Cantabrian Mountains occupy most of the interior of the province which is entirely inland. Vines and cereals are cultivated and salt is manufactured. Chief town: Vitoria (pop. c. 30 000). Pop. c. 100 000.

**Alb** a vestment used in the Church of Rome and by some clergy of the Church of England worn by the priest beneath the chasuble (qv) at the celebration of Mass and certain other services. It is a long white tunic with sleeves touching nearly to the feet.

**Alba Duke** of see ALVA

**Albacete** (1) Modern province of S.E. Spain comprising N half of Murcia. The province is generally mountainous with some fertile valleys but is thinly inhabited. There is a great deal of agriculture and bulls reared here are in great demand for bull fighting. Area 5 00 sq m. pop. (est. 1931) 336 700. (2) Capital of the above pop. 4,900.

**Albacore** a large fish of the mackerel family reaching a length of about 6 ft and found in the Atlantic. It feeds largely on flying fish.

**Alba-Juha**, town in Transylvania formerly named Karlsburg (Ge.) or Gyulafehérvár (Mag.) of some political note as the scene of the proclamation of the annexation of Transylvania to Roumania (1918).

**Alba Longa**, parent city of the group settlements on the plain of Latium in Italy from which Rome was subsequently to emerge into prominence. Alba Longa was destroyed in very ancient time but archaeologists place the site c. 12 m S.E. of Rome.

**Alban**, St (d. c. 304) protomartyr of Britain suffered death by the sword for the Christian faith. The monastery of St Albans Herts. was founded in his

memory by King Offa in 795. His day is kept by the Roman Catholic Church on June 22, and by Anglicans on June 17.

**Alban Hills**, group of extinct volcanoes S E of Rome, rising to over 3000 ft above the sea.

**Albani, Madame** (stage name of *Marie Louise L. C. Lajeunesse*, 1851-1930), Canadian opera and oratorio singer, was one of the finest sopranos of her time. Sullivan and Gounod both composed works for her. She retired in 1911 and received the DBE in 1925.

**Albania** (*Shqipëria*), a mountainous kingdom on the E coast of the Adriatic Sea, bounded on the S and S E by Greece, and on the N by Yugoslavia. The mountain chain, which runs close to the coast in Dalmatia, retreats E farther S, leaving a coast plain c 30 m wide between Dulcigno and the bay of Valona. In Epirus the mountains again approach the sea. This coast plain with its mountainous hinterland and the district of Epirus, as far S as Corfu constitute Albania. The land frontiers have been difficult to define in the absence of clear-cut natural divisions, a difficulty increased by the migratory habits of the hill peasantry. Area 10,630 sq m.

**Relief** The mountains of Albania are a complex series of ranges running usually E to W, built of limestone in the N but much less uniform in structure to the S. Highest peaks reach 8500 ft. The coast plain is interrupted by low limestone hills, the summits of a depressed range about which heavy deposits of alluvium have built up the plain. The chief rivers are the Drin in the N, the Shkumbi in the centre, the Semeni and Viosa in the S. The Drin breaches the Albanian Alps in a tremendous gorge, and flows E to the Adriatic near Scutari, the lower stream is much interrupted by silt. The Shkumbi is important as affording a pass through the central mountains.

**Climate and Vegetation** Albania has the characteristic Mediterranean climate in the lowlands with dry sum-

mers and winter rains; the plains are unhealthy. The highlands have a modified climate of the same type, with some rain in summer and a milder temperature. The S is forested chiefly with oaks, and the N has a mixed deciduous and coniferous forest. The lowlands are clothed in scrub, and produce the usual Mediterranean fruits: vines, olives, etc. Some tobacco is grown.

**Population** Albania might, with reservations, be called the Afghanistan of Europe. It is politically backward, disturbed by clan feeling which difficulties of communication in the mountains have fostered, but with some infusion of modern civilisation. The inhabitants are racially divided into Ghegs in the N and Tosks in the S, both speak the same language with dialectic variants. There is an infiltration of other Balkan races. About 70 per cent of the pop is Mohammedan, 20 per cent of the Orthodox Albanian Church, and 10 per cent Roman Catholics, chiefly Ghegs of the N. Occupations are almost entirely agricultural and pastoral. Rice-fields, vineyards, and orchards are cultivated in the lowlands, but the Albanians are not skilful growers. Chief towns: Tirana, the capital (30,900), Shkoder or Scutari (29,000), Vlone or Valona (9000). Pop (1930) 1,003,100.

**History** Albania was formerly part of the Byzantine Empire. At the close of the 15th cent, the hills of Albania were the last refuge of independent Christianity against the Turk. George Castrioti (Skanderbeg) headed an epic resistance, but Albania was eventually overpowered, and remained in the Ottoman Empire till 1912. In that year the London Conference agreed to Albania's autonomy, and in 1913 Prince William of Wied was crowned, governing with the help of an International Commission of Control. This Government fell in 1914. During the World War Albania fell into anarchy, and Italy intervened to proclaim Albanian independence (1917). In 1925 Albania was proclaimed a republic. In 1928 a

Constituent Assembly set up a democratic monarchy under King Zog I who had been President of the republic is Ahmed Bey Zogu. A treaty in force between Albania and Italy is regarded by a growing Albanian opposition as the exercise of a virtual Italian protectorate over the country.

**Albanian Language** The is spoken by nearly a million people on the E coast of the Adriatic between Montenegro and Epirus. It is a member of the Indo-European (q.v.) family of languages but it has borrowed extensively from neighbouring languages.

**Alban Lake** Italian lake in the crater of an extinct volcano 1.5 m from Rome in the Alban Hills.

**Albany** (1) River port and capital of New York State U.S.A. on W bank of the Hudson. An old Dutch settlement. Manufactures textiles hardware and chemicals. Pop (1970) 197,100. (2) Seaport W Australia sit on fine natural harbour in King George Sound. A coaling sta temporarily in decline owing to developments in Australian economic organisation. Pop (1931) 3918.

**Albany** Leopold George Duncan Albert, Duke of (1833-1884) youngest son of Queen Victoria created Duke of Albany in 1881 married in 1851 Princess Hélène of Waldeck Pyrmont. Their son as Grand Duke of Saxe-Coburg Gotha fought against the Allies in the World War and was deprived of his British titles in 1919.

**Albatross** a large sea bird related to the petrels is characterised by three-toed webbed feet and a strong hooked beak. Both sexes are white and grey in colour with dark bands on the back and dark wings. The albatross is noted for its graceful soaring flight and the large species of the S ocean is the largest sea bird known weighing 10 lb and attaining a wing spread of 17 ft. It nests on Tristan da Cunha and neighbouring islands and lays only one egg at a sitting. It is capable of prolonged flights. There are about 20 species several of the smaller being found in the Pacific off the Americas.

Occasionally they are found inland.

**Albedo** (a tron) see SOLAR SYSTEM.

**Albemarle Duke and Earls of**, see MONK GEORGE and KEFFEL.

**Albeniz, Isaac** (1860-1909) Spanish pianist and composer best known for his Iberian suite. His pianoforte music contains many colourful studies in the national rhythm and melodic idioms.

**Albert**, town in N France on upper Somme figured in the heavy British fighting of 1916 and 1918 when it was almost totally destroyed. The Leaning Virgin was the image of the Virgin at the top of the church spire which despite the bombardment stood in a horizontal position for a long time before it finally fell.

**Albert I** (b 1870) became king of the Belgians in 1909. He was married in 1900 to Elizabeth Duchess of Bavaria. Their children are Prince Leopold their apparent Duke of Brabant (b 1901) Charles Theodore (b 1904) and Marie Jo (b 1906). During the World War he remained at the head of the Belgian forces at La Panne (near G.H.Q.). He led the Belgian army in Oct 1918 entering Charleroi on 21 and Brussels on 22.

**Albert Prince Consort of England** (1819-1861) second son of Duke of Saxe-Coburg-Gotha & married with Queen Victoria who was opposed by William IV in 1840. His work in the early years of prosperity and the highly valued holding of the title in 1841 and 1842. He was originally opposed to the success of the Great Exhibition erected in 1851. He was opposed to the success of the Great Exhibition erected in 1851.

**Albert**, Prince Consort of England. Prince of Wales. He was married to Queen Victoria in 1840. He was the first Prince of Wales to be married. He was the first Prince of Wales to be married. He was the first Prince of Wales to be married.



district of the N W Territories Area, 255,285 sq m

**Relief** Most of the province is included in the great glacial plain of central N America, and is therefore prairie land. The S W corner includes the E foothills of the Rocky Mountains, and the opposite area to the N E a small fraction of the central plateau (called in its western half The Height of Land). Alberta is watered by three large rivers. The Peace R rises in the Rockies and flows N E into Lake Athabasca (partly in Saskatchewan), the Athabasca rises near Mount Hooker farther S, and flows on a course more directly N also to Lake Athabasca, thence the Slave R flows N to the Great Slave Lake (whence the Mackenzie R flows to the Arctic Ocean). The Saskatchewan R drains S Alberta E to Lake Winnipeg. There are numerous other lakes, of which the Lesser Slave is the largest.

**Climate** The climate is continental, with severe summer heat and winter cold. Precipitation is slight, averaging 11-16 ins.

**Productions** The soil of the glacial plain is naturally fertile, but lack of rainfall makes irrigation desirable in parts of the province. About one-fourth of Alberta is under cultivation, and the province ranks after Saskatchewan as the second largest wheat-producing area in the Dominion. Oats, rye, and barley also provide large crops. Ranching is an important industry, and is still carried on in parts as a separate occupation. The forests of the N are a valuable source of lumber. Mining in the Rockies is of growing significance. About four-fifths of Canada's native supply of coal is believed to be deposited in Alberta. Anthracite, lignite, and bituminous deposits cover extensive areas. Petrol of high quality is produced in the Turner Valley. The output of coal in 1931 was 4,564,290 tons.

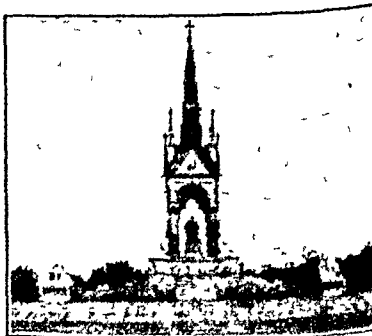
**Communications.** Alberta is served by 5700 m of railway and over 220,000 m. of telephone. The main Canadian Pacific Railway crosses the province

through Medicine Hat and Calgary and over the Rockies by Kicking Horse and Crow's Nest Passes. The Canadian National Railways run farther N from Winnipeg through Edmonton and across the Rockies by Yellowhead Pass.

**Population** Alberta is one of the most recently developed provinces of the Dominion and its towns are "mushroom cities." The urban pop is now nearly 50 per cent of the whole. Chief towns are Edmonton (79,000), Lethbridge (13,500), Medicine Hat (10,500). Calgary, the provincial capital, has a pop of 4000. Pop of province (1931) 731,605.

**Albert Medal**, decoration for gallantry in saving life at sea or on land founded in 1866.

**Albert Memorial.** A monument in Kensington Gardens opposite the Albert Hall, erected in memory of the Prince Consort of Queen Victoria. It stands on a square base, flights of steps leading up on each side to an



Albert Memorial

ornamental metal railing and there to a seated statue of the prince, enclosed by the columns of 4 Gothic arches and surmounted by a spire. The whole was designed by Sir G. Scott, and is highly elaborate in detail with groups of statuary and ornamental reliefs. It was begun in 1875 and unveiled in 1876.

## Albert

**Albert Nyanza**, Lake in W rift valley N of Mount Ruwenzori Uganda British E Africa 2000 ft above the sea c 100 m long and 2° m wide receives much of the Nile drainage (White Nile Victoria Nile Semliki) shallow but navigable save in S Discovered by Sir S Baker in 1864 Area c 1600 sq m

**Albert Victor Prince** *see* CLARENDON DUKE OF

**Albertus Magnus** (1096-1280) the Universal Doctor scientist theologian and philosopher of amazingly wide knowledge He entered the Dominican order in 1223 and was the teacher of St Thomas Aquinas He was canonised in 1931 feast Nov 18 *See also* ALCHEMY

**Albigenses** [*from* ALBIGEN *see*] a heretical Christian sect found in Provence and N Italy in the 13th cent They were condemned by the Papacy and were practically exterminated by the middle of the century after a crusade against them

**Albinism**, a variation in colour due to the complete or partial absence of the normal pigment in the skin hair feathers scales etc It occurs in man and other animals both wild and domesticated and is well exemplified by fancy breeds of mice In these complete albinism is manifested by white specimens with pink eyes partial albinism by fawn specimens with claret-coloured eyes this stage in colour suppression coming between the complete albino and the normal brown mouse In other partial cases albinism may affect portions of the body only resulting in black and white and brown and white the so-called piebald and skewbald specimens

**Albion**, name given in antiquity to the British Isles it still survives in poetic allusion The derivation is uncertain The Romans associated it with *albus* in reference to the white chalk cliffs of the S.E. coast.

**Albite**, *see* FELSPAR

**Albuera** or **Alubera** a village and stream of Estremadura near Badajoz in SW The scene of the

## Albury

fiercest battle of the Peninsular War (1811) The British and Spanish troops won a victory in a soldiers' battle over the French under Soult which inspired a classic passage in Sir W Napier's *History of the Peninsular War* The battle is finely described in *The Dynasts* by Thomas Hardy

**Albula Pass** an important Alpine pass leading into the upper Engadine from the North

**Albumin** The albumins are a type of protein (*qv*) a widely occurring class of compounds found in all living matter The term albumin was originally applied to the whites of eggs but has since been extended to all proteins of a similar type Albumins are soluble in water and dilute salt solutions Their solutions are neutral they are coagulated by heat Albumins may be obtained in the crystalline condition They all contain sulphur in combination and some of them give additive compounds with metals known as albuminates The principal albumin of industrial importance is casein (*qv*)

**Albuquerque** (1) Railway centre and principal town of the State of New Mexico in S of USA on E bank of Río Grande R (alt 4000 ft) trade in Indian blankets hides and wool University of New Mexico in neighbourhood Pop (1930) 26 500 (2) Small town of SW Spain near Portuguese frontier formerly of strategic importance Pop c 11 000

**Albuquerque Afonso d** the Great (1453-1511) Portuguese conqueror who added Goa (1510) Malabar (1508) Malacca (1510) and Ormuz (1507) to the possessions of Afonso V of Portugal Jealousy at home caused his retirement in 1515 He was a great soldier (the *Portuguese Mars*) and a just and popular ruler

**Alburnum**, the youngest wood of a tree also called sapwood the outer most layer *See also* TIMBER

**Albury** Australian town in Goulburn co NSW centre of a great sheep-grazing district which also grows wheat and vines Pop 9800

**Alcæus**, early Greek lyric poet, c 600 B.C., friend of Sappho (qv). Only fragments of his poems are extant.

**Alcaics** [ALKĀ'IKS], a strophic form of Æolian poetry used, among the Greeks, by its inventor Alcæus (from whom it takes its name), Sappho, and others, and by Horace in Latin. It has been well imitated in English metre by Tennyson, as follows

Ō mighty mouthed inventor of harmonies,  
Ō skilled to sing of time or eternitŷ,  
God gifted organ voice of England,  
Milton, a name to resound for ages

**Alcalá**, name of 13 Spanish towns, all of Moorish origin. *Alcalá de Henares*, the most important, was the seat of an important university till 1836, when it was removed to Madrid. Pop. c 11,000.

**Alcantara** (1) Town in W of Spain famous for its bridge built over the Tago by the Roman Emperor Trajan, which still exists, pop. 1000. (2) Port in Brazil, c 15 m from Maranhão, on opposite side of Bay of San Marco. Exports cotton and rice.

**Alcazar** (or *Alcagar de San Juan*), town and railway centre in S Spain, c 60 m S of Madrid, centre of wine trade, manufactures soap and gunpowder. The surrounding district is associated with *Don Quixote* and its author. Pop. c 16,000.

**Alcester**, Warwicks, on R. Alne, a tributary of the Warwickshire Avon, a market town on the site of a Romano-British village, pop. 2200.

**Alcestis** (Gr. mythology), the wife of Admetus, consented to die in place of her husband, but was rescued from Hades by Heracles. The story is the subject of one of the best-known plays of Euripides (qv), translated into English by R. Browning in *Balaustine's Adventure*.

**Alchemy** is, strictly speaking, the science of the transmutation of the elements, and more particularly of the transformation of base metals into gold. The word has, however, somewhat altered its significance in modern

usage, and now signifies the art of chemistry as practised in olden times before it was placed on a scientific footing, that is, up to the beginning of the 18th cent.

Alchemy is based on the idea that a matter is essentially composed of one substance which appears in different forms, and that it should be possible by physical treatment to cause one form to change into another.

The alchemists were chiefly concerned with the study of metals, since their fundamental aim was the manufacture of gold. The alchemical theory of the composition of metals, which held sway for a considerable period, was that they were mixtures of sulphur and mercury in various proportions. Whilst in many cases the alchemists probably considered metals to be physical mixtures of these two substances, they also meant to suggest that the metals were compounded from the characteristic properties of sulphur, namely, inflammability and colour, and those of mercury, lustre and metallic properties.

This theory of the composition of metals was the spur to all alchemical work, which sought, by varying the proportions of the "constituents," to turn common metals into gold, which was considered the noblest and "purest" form of matter. The method by which it was hoped to effect this transmutation was by means of a substance which would remove the imperfections from base metals and turn them into gold or silver. This material became known as the *Philosopher's Stone*, and it was thought that a minute amount of it would suffice to change large quantities of common metals into gold. A solution of the philosopher's stone in liquids (more specifically in spirits of wine) was described as the *Elisir of Life*, and it was credited with the power of conferring eternal youth or at least of considerably prolonging the normal span of existence.

Of the European mediæval alchemists the best known are Albertus Magnus (qv), Roger Bacon, the

English alchemist and the reputed discoverer of gunpowder and Basil Valentine who is chiefly known for his researches on antimony and his advocacy of its use in medicine.

At the beginning of the 16th cent alchemy entered into the phase of iatrochemistry that is the study of the medicinal use of chemical compounds which somewhat overshadowed but did not completely eclipse the search for the philosopher's stone. The most famous iatrochemist was Paracelsus (1493-1541) who exerted a very great influence on the chemical thought of his time. Another great iatrochemist was John Baptist van Helmont (1577-1644) who lived in Brussels and to whom we owe the term gas as well as the earliest researches on carbon dioxide. Van Helmont held the view that the basic foundation of all matter was water. He believed in the transmutation of the elements and has left an extremely good description of an alleged transmutation of mercury into gold which he is stated to have accomplished. It is well to remember that we are indebted to the alchemists for a large amount of the empirical knowledge that laid the foundations of true scientific chemistry. While the alchemical theories were erroneous inasmuch as they were based on misinterpreted experimental evidence it is interesting to note that modern theories of the structure of matter have reverted to the view that all substances are composed of the same essential fundamental materials which are merely altered in disposition. Transmutation of the elements is now known to be possible on a minute scale though by methods widely different from those attempted by the alchemists. The evidence for the formation of gold from mercury is however doubtful and it can probably be said with safety that artificial gold has not as yet been made.

Alchemades, *Alcides and Alcides*  
Redgrove (2nd ed. London)  
History of Chemistry by E. J.  
(Oxford, 1931)  
(450-404 B.C.) Athenian

general statesman and adventurer. During the Peloponnesian War (431-404 B.C.) he negotiated a quadruple alliance aimed at Sparta of Athens, Argos, Elis and Mantinea, but the Spartans defeated the confederacy at the battle of Mantinea in 418 B.C. On the eve of the Sicilian expedition he was involved in the scandal of the mutilation of the Hermals (415 B.C.) and on his recall from Sicily he deserted to Sparta. He subsequently won back Byzantium and Chalcedon and defeated the Spartan fleet at Abydos (411 B.C.) and Cyzicus (410 B.C.) returning to Athens in triumph in 407 B.C. Soon afterwards he was exiled. He was murdered in Phrygia in 404 B.C. He was of a vicious and unscrupulous character in spite of his association with Socrates.

Alcman or Alcman (7th cent. B.C.) Greek lyrical poet is thought to be one of the earliest writers of love poetry. Only fragments of his work are extant.

Alcock, Sir John William (1859-1919) British airman with Sir Wm. Whitten Brown made the first direct non-stop W. to E. Transatlantic flight (1919). He was killed while flying in France.

Alcohol is a chemical term denoting a particular class of organic chemical compounds (see CHEMISTRY ORGANIC). The word alcohol as commonly used refers to ethyl alcohol  $C_2H_5OH$  which is by far the most important and the commonest of the alcohols. Other names by which this substance is known are ethyl hydroxide, methyl carbinol, ethanol, grain alcohol, spirits of wine and Cologne spirit.

Ethyl alcohol is a clear mobile liquid with a vinous odour and a burning taste. It boils at  $78.4^\circ C$  and remains liquid to below  $-100^\circ C$ . It is lighter than water with which it is miscible in all proportions. The specific gravity is  $0.7936$  at  $15^\circ C$ , compared with that of water at  $4^\circ C$ . The ordinary plain spirit that is obtained by distillation is usually about 95 per cent. by volume alcohol. This is the nature of the spirit employed in tinctures.

the manufacture of transparent soaps, and for methylating for conversion into methylated spirit. The standard alcohol employed in pharmacy is the 90 per cent strength known as rectified spirit of "S.V.R.," an abbreviation of *Spiritus Vin Rectificatus*. For purposes of revenue and commerce the standard employed is "proof spirit." The strength of this is defined by Act of Parliament, and is equivalent to a mixture of alcohol and water containing 57.1 per cent of alcohol by volume (49.3 per cent by weight). For details as to the method of measuring the strength of alcohol, see ALCOHOLIMETRY.

The principal method for the manufacture of alcohol is by the fermentation of sugars or of bodies that contain substances convertible into sugar. The raw materials used vary considerably. In England the chief materials used are cereals but imported molasses are also employed. In continental Europe potatoes and rye are used, and in the United States maize.

Where a starchy material is used for the manufacture of alcohol the first process is to saccharify the starch so as to produce a fermentable sugar. This is accomplished by mashing the material with hot water and adding malt. This latter contains a ferment, diastase, which has the property of converting starch into sugar (saccharification). When this process is completed the temperature, which has been kept at about 55° C., is raised to about 68° C. in order to kill any bacteria that are present, and would otherwise feed on the maltose produced. The sweet mash is then cooled, and yeast is added to start the fermentation of the sugar. Yeast is a living organism which is of value on account of two enzymes that it produces, maltase and zymase. The first of these converts the maltose that has been produced by the action of diastase on starch into another sugar, known as dextrose, which is then fermented by the zymase, with the production of

alcohol and carbon dioxide. The temperature at which the fermentation is carried out should not exceed about 30° C. In addition to alcohol and carbon dioxide, which are the principal products of fermentation, several minor products are also produced, the chief of which are glycerine, fusel oil (see AMYL ALCOHOL) and succinic acid (qv). In the manufacture of spiritous liquors the fusel oil is an important constituent, since it is largely responsible for the flavour of these substances.

In addition to malt and yeast there are other substances, namely, certain moulds, which contain the necessary enzymes for the saccharification and fermentation processes, and the moulds are sometimes used industrially for these purposes. In addition to the sugar that is produced from starch by enzyme action, sugars that are fermentable to alcohol are also obtained from cellulose plant material, such as wood and straws, by hydrolysis with acid. This source of sugar is of considerable importance in view of the possibilities of using alcohol so produced as a source of power.

The hydrolysis of the cellulosic substances is carried out by heating under pressure with dilute acids. The yield of alcohol in the case of wood is about 20 gallons per ton of dry weight processed.

Alternative methods, however, are increasing rapidly in importance. Ethylene is a gas which till quite recently was allowed to run to waste in enormous quantities from petroleum cracking stills, and to a lesser extent in natural gas. By absorbing ethylene in concentrated sulphuric acid and decomposing the product so formed with steam pure ethyl alcohol is obtained in excellent yield. This process has recently been developed in the United States, and it is rapidly becoming of commercial importance. Ethylene is also found in small amounts in coke-oven gas.

Whilst there are many uses of alcohol in industry, its utilisation is somewhat complicated by the numerous

but legal restrictions with which it is hedged. Alcohol and spirituous and intoxicating beverages generally are one of the principal sources of revenue to the Government producing about \$115 millions per annum. For this reason special precautions have to be taken to see that alcohol used for industrial purposes is rendered unfit for consumption so that the revenue may not be defrauded. In general it may be said that all alcohol used in industry has been denatured in some way or another to avoid paying the extremely heavy duty due on pure ethyl alcohol. The denaturant must be a substance which whilst rendering the alcohol offensive to taste and smell does not preclude its use for manufacturing or other commercial purposes. Various grades of denatured alcohol are available some of which are limited by restrictions as to their use if the denaturant is of such a type that it might conceivably be removed from the liquid. The use of pure duty free alcohol is permitted in some cases such as those of scientific and educational institutes and in certain manufacturing processes with which the presence of an extraneous body such as a denaturant would interfere. In such cases a very thorough system of supervision and checking by revenue officials is in vogue.

The substance principally used as a denaturant is crude methyl alcohol or wood spirit. This is obtained by the destructive distillation of wood and is poisonous often causing blindness in those who consume it. The principal variety of denatured alcohol in this country is what is known as mineralised methylated spirit. This consists of ethyl alcohol to which about 10 per cent of wood spirit a little mineral naphtha and a purple dye have been added. The industrial methylated spirit which is the quality of alcohol generally used in England for manufacturing purposes is alcohol to which about 5 per cent of wood spirit has been added.

\* Industrial alcohol are

extremely varied. The principal use is as a solvent alcohol being the most important artificial solvent that is employed. A large amount of alcohol is employed in the manufacture of finishes such for instance as spirit varnishes and french polish. The use of alcohol as a solvent in the manufacture of chemicals for such purposes as extraction and recrystallisation also accounts for a very large amount. Alcohol is also one of the raw materials for the manufacture of many important chemicals such for instance as chloroform and ether. It is also used in the compounding of anti freeze solutions for motor-car radiators. The celluloid and film industries generally are also extremely large consumers.

A development in the use of alcohol which is becoming of importance is the possibility of its use as a motor fuel. Experiments show that a motor-car engine can be successfully operated on an alcohol fuel as long as certain important modifications are carried out. The most essential is to raise the compression value of the engine since the anti knock value of alcohol is much higher than that of petroleum fuels. It will also be necessary to make some arrangement for pre heating the fuel inlet since owing to the relatively small volatility of alcohol considerable difficulty is experienced in starting ordinary petrol engines from the cold state on alcohol.

Successful results have been obtained with fuels which are blends of alcohol with benzol or petrol or both. The presence of alcohol has an anti detonating effect and also tends to lower the operational temperature of the engine.

Alcohol has important physiological effects when drunk. It is an excellent source of energy and when taken in very small quantities is completely used up in the body with generation of heat. The special feature of alcohol drinking is however its affinity for the nervous system which causes drunkenness. Even a very small dose of alcohol such as that contained in a couple of pints

of beer will impair the performance of acts requiring skill and delicate muscular co-ordination. Larger doses cause a feeling of well-being and a loss of the normal inhibitions. One of the most striking symptoms of intoxication is the inability to estimate with any degree of accuracy the passage of time. With still larger doses coma ensues, and should this continue in excess of 12 hours death is probable.

The most serious pathological effects due to prolonged and habitual consumption of alcoholic beverages are cirrhosis of the liver, gout, and in extreme cases delirium tremens. Gastritis, with consequent wasting owing to inability to digest food properly, often occurs among drinkers of strong spirits.

If applied to the surface of the skin alcohol has a cooling effect owing to its rapid rate of evaporation, and it is sometimes used for this purpose, as in the application of scent to the forehead to relieve a headache. It is a mild antiseptic.

See *Alcohol*, by C. Simmonds (London, 1919), *Power Alcohol*, by G. W. Monier-Williams (London, 1922), Department of Scientific and Industrial Research, Fuel Research Section, *Fuel for Motor Transport*, 4th Memorandum (London, 1927).

For the manufacture of alcoholic beverages, see *BLER, SPIRITS, WINE*. For the physiology and pathology of alcohol, see *DRUNKENNESS*. See also *METHYL ALCOHOL* and *FERMENTATION*.

**Alcoholic Beverages**, see *BEVERAGES, ALCOHOLIC*.

**Alcoholometry** is the name applied to the measurement of the amount of alcohol present in a given mixture. Owing to the high duty on alcohol and liquids containing it, the determination of alcohol content is a very important operation from the commercial point of view.

In the olden days the only method available was by taste, which of course provides only the very roughest guide. The next refinement that was introduced was the gunpowder test. A

little gunpowder was moistened with the liquid under examination and the liquid under examination and the match was then applied. The strength of the alcohol was judged by whether or not the powder would ignite on contact with flame. Should it do so the spirit was termed proof spirit, if not, it was under proof. This, however, is only an approximation, and at the end of the 18th cent. the present method of determining the strength of alcohol by taking the specific gravity with the help of a hydrometer was introduced.

Proof spirit is defined by Act of Parliament to be an alcohol of such strength that at a temperature of 60° F it will weigh  $\frac{17}{16}$  of an equal measure of distilled water. Such a spirit corresponds to a mixture of water and alcohol containing 49.3 per cent by weight or 57.1 per cent by volume of alcohol.

In fiscal practice proof spirit is regarded as being equivalent to pure parts and spirit stronger or weaker is expressed as being over or under proof. Thus 100 gallons of spirit which has been found to be "30 degrees under proof" will be taxed as if it were 70 gallons of proof spirit, whilst if it has been "30 degrees over proof" the tax payable would be equivalent to 130 gallons. It should be noted that the tax is payable on volume, not on weight, and when the determination of alcohol content is carried out at 61° F, the tax is payable on the actual amount of spirit which has been imported. This amount will of course vary with the temperature, depending in turn, on the weather.

In the United States "proof spirit" is different in strength from that of the United Kingdom, and is defined as a mixture of equal parts of alcohol and water (by volume) at a temperature of 15.6° C.

The content of alcohol in alcoholic water mixtures may also be estimated by a determination of the refractive index of the mixture and comparison with predetermined tabulated values.

A field where the determination of alcohol content is of importance is forensic medicine. The question

## Alcohols

103

## Alderney

saying whether or no an individual is intoxicated has of recent years grown in importance chiefly in connection with motoring cases where the offence of being drunk in charge carries such severe penalties. Methods have recently been perfected whereby by an estimation of the alcohol content of the blood or urine it is possible to tell with fair accuracy the amount of alcohol that has been consumed in the past few hours. Due allowance must of course be made for the possible presence of a pathological condition such as acetonaemia which would invalidate the test.

**Alcohols** The alcohols are a group of organic compounds characterised by the possession of one or more hydroxyl (OH) groups. The lower alcohols are liquid and soluble in water but both these properties disappear with increase in molecular weight.

The higher aliphatic alcohols occur in nature in considerable amounts in the form of esters which are the principal constituents of the waxes e.g. myristyl alcohol which occurs in beeswax (qv). In the case of compounds where the word alcohol does not occur in the name alcohols are to be recognised by the termination -ol. The principal alcohols are discussed under their own headings e.g. ALCOHOL AMYL ALCOHOL etc.

**Alcott, Louisa May** (1832-1888) American authoress. Her early works were sensational novels and her most famous book did not appear until 1868. This was *Little Women* a children's classic. Other similar works are *Jo's Boys* (1896) *Shawl Straps* (1897) *Moods* (1864) and *Jack and Jill* (1860).

**Alcuin** (735-801) Anglo-Saxon scholar and teacher became head of the York Cathedral school. He was brought by Charlemagne to his Court where he greatly distinguished himself as a teacher. His influence was more important than his works which include verses a grammar versified annals and lives of saints.

**Aldebaran**, see CONSTELLATIONS  
seaside resort on the

R. Alde. Suffolk formerly of considerable commercial importance now reduced by erosion to a fishing village. Crabbe the poet was born here. Pop. about 3000.

**Aldegrevier Heinrich** (1500-1558) Westphalian artist and engraver. Few of his printings survive but many of his engravings.

**Aldehydes** The aldehydes are a group of organic compounds which are characterised by the presence of the CHO group. Aldehydes are to be found both in the aliphatic and aromatic series. They are designated either by a name containing the word *aldehyde* or else by the termination -al.

The usual method of preparation of aldehydes is by oxidation of the corresponding primary alcohol. Most aldehydes are compounds having a pronounced usually pleasant odour and a great many of them are used in perfumery.

The principal aldehydes are discussed under their own headings e.g. ACETALDEHYDE FORMALDEHYDE etc.

**Alder** (*Alnus*) a hardy deciduous native tree for planting by watersides and in damp situations. *Alnus incana* is the most handsome garden kind.

**Alderman** originally a Saxon title signifying a noble on next to the king. Later a magistrate. To-day a member of a Municipal Corporation or County Council not directly elected by the local electors. By the Municipal Corporations Acts 1835-1888 aldermen are chosen by the elected municipal councillors for a period of 6 years half the number retiring every 3 years.

**Alderney** the most N of the Channel Islands is a tidal land with a rugged coast strewn with reefs including the notorious Casquets. The Race of Alderney separates the island from France and there is another dangerous current between Alderney and the rocks W of it. Chief town St Anne in the centre of the island interesting for some survivals of mediæval agricultural organisation extinct in



England Products, chiefly vegetables for early season markets in France and England Alderney is included in the bailiwick of Guernsey, but has a separate local government Area 3½ sq. m., pop (declining) c 1600

**Aldershot**, town and municipal borough in N.E. Hants Important garrison town and military training centre First utilised as training camp in 1853, it is now one of the six "commands" into which Great Britain is organised for military purposes Pop 34,300

**Aldhelm**, St., or *Caldhelm* (c 640-709), Abbot of Malmesbury (676) and Bishop of Sherborne (705), built three churches and two monasteries, of which only the Church of St Lawrence at Bradford, Wilts, is standing

**Aldine Press**, the name of a famous printing press founded by Aldus Manutius (q.v.) in Venice, in the late 15th cent Certain Aldine editions of the classics are among the most eagerly sought examples of typography, and the first books to be printed in italic type came from this source

**Aldington**, Richard (b 1892), English poet of the Imagist school, served in the World War His works include *War and Love* (1918), *Exile and Other Poems* (1923), *Collected Poems* (1928), *Literary Studies* (1924), and *Voltaire* (1926), *The Colonel's Daughter* (1931), *Last Straws* (1931), and *Soft Answers* (1932) His wife, "H. D.", is also a poet of repute

**Aldol**, see ACETALDEHYDE

**Aldred** (d 1069), Bishop of Winchester (1044) and Archbishop of York (1060), intrigued for the return of Edmund Ironside's son, but surrendered to William the Conqueror and crowned him (1066) He was the first English bishop to visit Jerusalem (1058)

**Alekhine**, Alexander Alexandrovich (b 1892), Russian chess player He won the World Championship from Capablanca (q.v.) in 1927, and retained the title by beating Bogoljubov in 1929

**Alembert**, Jean le Rond d' (1717-1783), a Parisian founding, who

became a member of the Academy of Science. He laid down "d'Alembert's Principle" which revolutionised the science of mechanics (q.v.) D'Alembert became a member of the Académie Française in 1754 He was also associated with Diderot as one of the foremost *encyclopédistes*

**Alembic**, a piece of apparatus used in alchemy, the nearest modern equivalent is the laboratory type of retort

**Alemtejo**, ancient province in S. Portugal, separated by R. Tagus from Beira on N. The largest province in Portugal (9224 sq. m.); of no great economic importance Capital, Évora Pop 579,400

**Alençon**, town, N. France, departement Orne, manufactures lace The fief of Alençon has a distinguished history first held by the Talvas family of Bellême, who were typical feudalism at its worst Alençon became, as a dukedom, an appanage of the French royal family Pop 15,000

**Aleppo** (Fr *Alep*), town in French mandated Syria, capital of vilayet Haleb Tobacco and cotton are extensively grown in the district Alep is one of the chief centres of the Syrian silk industry In the Middle Ages was an important town on the caravan route between the Syrian Coast and the Persian Gulf, with a large trade in textiles, but declined with the discovery of the new sea-routes to India 1400 the Tartars under Tamerlane sacked the town after defeating the Syrians, and in 1516 the Turks under Selim I routed the Egyptians he thus annexing the whole of Syria to the Ottoman Empire From 1833 to 1840 it was under Egyptian rule was occupied by British and Australian troops in Oct. 1918 Pop 177,000.

**Alès**, see ALAIS

**Alesia**, Gallic fortress, the centre of the resistance of the chieftain Vercingetorix to Julius Caesar, 52 B.C. Caesar's victory completed the conquest of Transalpine Gaul The town is usually identified with the modern Alise-Sainte-Reine

**Alessandria**, Italian town in Piedmont, capital of province of the same name. A railway centre and fortress. Alessandria was named after Pope Alexander III the opponent of Frederick Barbarossa and built (1168) by the league of the Lombard communes to control the route into Lomardy from the mark of Montferrat. Pop. (1911) town 8 600 province 756 000.

**Aletsch Glacier** the largest ice-stream in the Alps flows S from the Jungfrau in the Bernese Oberland into the upper Rhône valley c 11 m in length. The neighbouring Aletschhorn (13 700 ft) is one of the great peaks of the Alps.

**Aleutian Islands** a string of islands extending from Alaska in a westward curve on a line convex to S and terminating some distance E of the coast of Kamchatka. They are partially volcanic in origin and geographically a continuation of the Aleutian Mountain range on the mainland. Extending for over 1000 m they virtually separate the Behring Sea from the N Pacific. Inhabitants are Eskimos, fishers and fur traders. The islands are barren and mostly under U.S. Government. Pop. over 1000.

**Alexander** name of eight popes.

**Alexander I** (106-115).

**Alexander II** (1061-73) gave his sanction and a sacred banner to William the Conqueror when he invaded England.

**Alexander III** (1159-81) sanctioned the invasion of Ireland by Henry II and supported the Lombard league against the emperor Frederick Barbarossa.

**Alexander IV** (1254-61).

**Alexander V** (Antipope) (1409-10).

**Alexander VI** (1494-1503) (Rodrigo Borgia) an avaricious and immoral cardinal who attained the chair of St. Peter by bribery. He degraded and plundered the Church to a vast extent in order to advance the wealth and position of his illegitimate children. Of these the best known are Giovanni (b. 1474) Cesare (b. 1476) and Lucrezia through them and their

father the name of Borgia has become a byword for vice and infamy. Yet Alexander was a great lover of art and the patron of Raphael, Michelangelo and Leonardo.

**Alexander VII** (1655-67).

**Alexander VIII** (1689-91).

**Alexander** name of three emperors of Russia.

**Alexander I** (Pavlovich) (1775-1825) crowned in 1801 was of nervous temperament and followed an extremely contradictory policy. He was at once a free thinker, a follower of Rousseau and an autocrat. In 1801 he reversed traditional Russian policy by renouncing the Armed Neutrality of the N. In 1808 he was with difficulty persuaded to join Napoleon and sign the Treaty of Tilsit but by 1810 they were again enemies and in 1812 Napoleon marched on Moscow. After 1815 when at the Vienna Congress he proposed the Holy Alliance he came under the influence of Metternich.

**Alexander II** (Nikolaevich) (1818-1881) on his succession in 1855 proceeded quickly to end the Crimean War and devoted his attention to internal reforms. These (including the emancipation of the serfs in 1861) caused the formation of Conservative and Radical Parties. A plot among the extreme Radicals (Nihilists) caused his assassination in 1881.

**Alexander III** (Alexandrovich) (1845-1894) son of Alexander II succeeded his father in 1881 but followed an autocratic policy.

**Alexander** name of three kings of Scotland.

**Alexander I** (1078-1124) the Fierce in whose reign (1107-24) the independence of the Scots Church was confirmed.

**Alexander II** (1198-1249) came to the throne in 1214. His sallies into England led to agreements with John and Henry III in an attempt to define his territory.

**Alexander III** (1241) taking possession of the NW devoted his time with reforming the admin.

**Alexander I (1857-1893)**, first prince of Bulgaria (1879). In 1881, Alexander became absolute dictator. The breach of the Treaty of Berlin by the union of Bulgaria and E. Rumelia (1885) caused a Serbo-Bulgarian War. He abdicated in 1886.

**Alexander (1893-1920)**, King of Greece. In 1917 he succeeded his father Constantine, who was dethroned on account of his pro-German sentiments during the World War. During his reign, with Venizelos as his premier, Greece shared in the Allied victory. He died from the bite of a pet monkey.

**Alexander I (1876-1903)**, Obrenovich, King of Serbia (1889), became autocratic ruler in 1893, but his marriage with Draga Mashin and his liberal ideas rendered him very unpopular. A military conspiracy brought about his murder, and that of his queen.

**Alexander I, King of Yugoslavia** (b. 1888), son of Prince Peter Karageorgovich and grandson of the Prince of Montenegro, took part in the Balkan War (1912) and headed the exiled Serbian Government during the World War. In 1918 he was appointed regent for his father, who died in 1921, when Alexander became king. In 1929 he instituted a dictatorship.

**Alexander (III), the Great (356-323 B.C.)**, King of Macedon, son of Philip II of Macedon by Olympias. Aristotle was partly responsible for his education. When 16, he first showed his military prowess by quelling a revolt that broke out in his father's absence. The next year (338) he fought at Chaeroneia (q.v.). In 336, Philip was assassinated and Alexander's accession was marked by barbarian risings and a revolt at Thebes. After dealing with the former, he marched on Thebes and completely destroyed the city.

To complete his design of a federated Greece, a war on Persia was necessary. In 334 he brilliantly defeated the Persians at the R. Granicus, and eventually conquered and placed under Macedonian rule the whole of Asia Minor. At the battle of Issus (333), he routed the army of Darius III, and by

331 had conquered Syria and Egypt, where he founded Alexandria. He then again marched into Persia and finally defeated Darius at Arbela, Persia was now practically his, and the amount of treasure captured was enormous. Some unrest now began to be felt by the Macedonians as a result of the change in Alexander's character. He was beginning to develop all the characteristics of an Oriental tyrant, and his hitherto great popularity with the army began to wane.

His last great project, the invasion of India, was realised in 326. He reached the Gate of the Ganges, but the army refused to go farther. He was therefore forced to return to Babylon, where he died of fever in his thirty-second year.

Alexander's method of dealing with conquered territory, which caused the revolt of the army, was in advance of his times. He attempted not to crush but to absorb conquered nations, and desired his soldiers to mix freely and intermarry with the conquered, himself setting the example. This conduct lost him the respect of his army, but gained him in later times the reputation of a great administrator as well as of a magnificent soldier and strategist.

**Alexander Severus, Marcus Aurelius (205-235)**, Roman emperor, succeeded (222) his cousin Elagabalus, and gained a name for purity, wisdom, and piety. He defeated Artaxerxes, a Persian revolutionary, in 232. He was assassinated at Mainz in 235.

**Alexander, Sir George (1858-1918)**, actor-manager, joined Irving at the Lyceum (1881), and soon became a favourite with audiences, especially in lovers' rôles. In 1891 he opened at the St James's Theatre.

**Alexander of Hales (d. 1245)** (*Doctor Irrefragabilis*), born in Gloucestershire; a famous teacher of theology in Paris. In 1222 he became a Franciscan friar, and wrote a *Summa Theologiae*.

**Alexander, William (1824-1911)**, Protestant Bishop of Armagh and Primate of All Ireland (1896), wrote

theological works and some poems. His wife Cecile Frances was a well known hymn writer and authoress of

There is a green hill far away

**Alexanders** (bot. *Smyrnium olusatrum*) an herbaceous plant formerly believed to possess powerful medicinal properties. It was also much cultivated for its stems which when blanched resemble celery. It should be sown from the end of March to the beginning of May in drills 3 ft apart. Thin the seedlings when 2 ins high to 1 ft apart and earth them up to blanch like celery when 1 ft high. Grow on a rich light soil and give plenty of water and liquid manure.

**Alexandra** (Alexandra Caroline Marie Charlotte Louise Julie) (1844



Queen Alexandra

19 J) Queen Consort of England daughter of Christian IX of Denmark married Edward VII in 1863. Their sons were Albert Victor Duke of Clarence (d. 1891) and King George V. Alexandra was greatly loved in England; she was much interested in social and

charitable work and instituted *Alexandra Day* on which an annual street collection is made for hospital funds throughout England.

**Alexandretta** (or *Iskanderun*) sea port in Syria, on the bay of Alexandretta, the outport of Aleppo and district exports tobacco silk and textiles. Pop. 14,000.

**Alexandria**, the busiest port and second largest city in Egypt situated W. of the Nile delta, partly on a peninsula between Lake Maryout and the

Mediterranean and partly on the isthmus joining Pharos to the mainland. Alexandria is the chief outlet for Egyptian trade and the main port of entry from Europe. An active modern city with a fine harbour, docks, customs, warehouses, electric tramways and telephone service. A main railway line from Cairo runs to Alexandria with an extension thence to Rosetta. Alexandria handles about four fifths of Egyptian trade: exports cotton, wool, rice, cereals and beans and imports textiles, machinery and coal. Pop. (1917) 573,000. The city was founded in 332 B.C. by Alexander the Great and soon became the commercial centre of the E. Mediterranean and the chief mart for trade between Europe and the East. Under the Ptolemies Alexandria was second only to Rome in wealth and in culture; it was supreme. After the Roman conquest it became the seat of one of the most vigorous of the early Christian Churches: the names of Arius and Athanasius are associated with it. At the same time it was the centre of pagan culture and of late Greek and neo-Platonic philosophy and science. After the Arab conquest in A.D. 640 the city gradually declined and was almost ruined by the change in the trade routes at the Renaissance period. The exertions of Mehemet Ali led to a revival of prosperity in the 19th cent. and this was furthered by the opening of the Suez Canal and the British reorganisation of Egyptian internal affairs.

**Alexandrine** [ALEXANDRINE] a twelve-syllabled line of verse usually of iambic rhythm containing six complete beats e.g. And I like a wounded snake drags its slow length along. It is the usual vehicle of the French poetic drama, but in English verse it generally occurs in iambic pentameter as a variant from the decasyllabic line. The last line of the Spenserian stanza (p. 10) is invariably an alexandrine.

**Alexandropol**, see LENINAKHAN  
**Alexandrovsk**, see ZARFORDNE

**Alexei (Petrovich)** (1690-1718), eldest son of Peter the Great, whom Alexei's son succeeded. Alexei himself was debarred from the succession through his opposition to his father, and died in prison. Cf. Menzhkovsky's novel, *Peter and Alexei*.

**Alexei, Mikhail Vassilievich** (1857-1918), Russian general, the ablest Russian staff officer in the World War. The evacuation of Vilna (1915) and the victories over the Austrians in 1914-15 were largely the result of his skill.

**Alexius Comnenus** (1018-1118), the ablest ruler of the Byzantine empire. His great popularity with the army secured him the throne in 1081. He had to contend with Scythian, Turkish, and Norman invaders, and delayed the destruction of his empire for 37 years.

**Alfalfa**, the leguminous plant *Medicago sativa*, also known as lucerne (*qv*).

**Alfieri** [*ALFIERI*], Count Vittorio (1749-1803), Italian dramatist, famous as a lover of horses, wrote the first

Italian tragedy (of which *Alele* is the best known). Alfieri is famed for his quick temper and passionate nature; his autobiography is interesting.

**Alfloc**, see **ROTHIC COMPOUNDS**.

**Alföld** [*Fusztas*], name given to the Hungarian plain between the Danube and the Carpathian Mountains. The granary of the Magyars, also produces wine and fruit.

**Alfonsine Tables**, see **ASTRONOMY, HISTORY OF**.

**Alfonso XIII** (b. 1886), ex-King of Spain. Succeeded Alfonso XII, who died before his birth. On attaining his majority, he attempted to ameliorate conditions and reform the effete governmental system. His assassination was thrice attempted. His reign was marked by a series of risings in Spanish N. Africa, which were never finally suppressed. During the World War, Alfonso preserved Spain's neutrality. In 1917, General Primo de Rivera became dictator. The Constitution was suspended in 1923. Revolts in 1920 and 1930 foreshadowed the result of the elections of 1931, in which the Republicans attained a vast majority, and Alfonso abdicated, but without renouncing his rights. In Nov. 1931, Alfonso was outlawed, and Zamora was elected President in December.



Alfred the Great.



Alfonso XIII, Ex-King of Spain

## Alfred

135

## Algebra

**Alfred the Great** (842-900) King of England succeeded his brother in 871. Until 878 he was constantly at war with the Danish invaders under Guthrum but after the defeat at Edington they were glad to sign the Treaty of Wedmore which restricted them to the territory North and East of a line joining Chester and London.

Alfred then turned his attention to the reform and repair of his realm and greatly improved the organization of the army and education. A strong navy was built and manned and played an important part in resisting the attacks of the Danes.

Minor wars with the Danes under Hasten occupied the latter half of the reign of this learned, brave and far-sighted king.

**Alfreton**, urban district and market town in Derbyshire, England, centre of an industrial area, ironworks, collieries, potteries, ancient church, pop. over 20,000.

**Algae** (bot.) comprise seaweed, pond scums and an enormous variety of microscopic plants to be found in fresh and salt waters and in any moist soil. The phenomenon known as red snow is due to the presence of algae in snow. Some consist of single cells others of an unbranched or branched filament of cells which in primitive forms are all alike and perform the same functions but in higher forms are differentiated into vegetative and reproductive cells while others have a well-developed vegetative body of a large number of cells. Some of the unicellular forms are motile and some of these are colourless and cannot be distinguished as animals or plants.

One line of evolution within the group led to *euglenoids*. Reproduction within the group is vegetative, asexual and sexual. Vegetative reproduction is by breaking of filaments into short lengths by splitting of colonial forms into two or more parts (*syzygia*) and by the formation of resting cells (*akinetes*). Asexual reproduction is by zoospores. These are ordinarily naked cells or *protoplasts* which have been

formed by division of the parent cell into two, four, eight or more parts. Sexual reproduction in the simpler forms is by fusion of similar motile gametes which often resemble the zoospores but are smaller. In higher forms the gametes show some differentiation leading in several advanced types of *chlorophyta* to *ogamy* where a large motionless female cell or *ovum* is fertilized by a much smaller active male cell or *spermatozoid*. All the known mixtures of the red algae exhibit a highly specialized *isogamous* sexual reproduction in which the male cells have no power of movement but are borne by water currents to the long neck or *trichogyn* of the female organ. The zygote or product of sexual fusion forms a resting spore the germination of which has only been observed in a few cases.

Typical classes of algae are green (*chlorophyta*), yellow-green (*heteokontae*), brown (*phaeophyta*), red (*rhodophyta*), blue-green algae (*cyanophyta*), stone-works (*charales*) and diatoms (*bacillariales*).

**Algaroba** (*Croton tiliqua*) The cashew tree. The name is also applied to *Prosopis glandulosa* and to *Hymenocallis* two South American trees as well as to a substance yielding a dye and tannin.

**Algarve**, southernmost and smallest province of Portugal with seaboard to S and W. An ancient kingdom. Mount S. George in N. the Serra de Monchique terminates in Cape St Vincent. Fertile in S. producing large quantities of fruit. Chief town Faro. Pop. (1930) 700,600.

**Algebra**, a more general form of arithmetic (*q.v.*) It employs the same fundamental processes of addition, subtraction, multiplication and division but instead of applying them to numbers as in arithmetic symbols or letters are used which can represent any number and thus the results are more general. Problems in algebra are generally solved by the use of equations which may be of numerous types (*see EQUATIONS*). The applica-

**Division** See ARITHMETIC When the quantities differ in sign, the result is negative, e.g. —

$$4ab \div -2a = -2b$$

**Equation** A statement in symbols that certain quantities are equal to one another, e.g.  $3x^2 + 2x = 1$

This statement is true only for certain values of  $x$ , and the determination of these values is called solving the equation. A statement such as  $2 \div 3x = 6x$  is true for any value of  $x$ , and is called an identity, and sometimes written with three lines, i.e.  $2 \div 3x = 6x$

Problems are solved by first writing the conditions down in the form of an equation in which  $x$  or  $y$  is usually the unknown, and then solving the equation by certain well-known methods. The highest power present is called the degree of the equation, e.g.  $3x + 4 = 2x$  is of the first degree or linear,  $6x^2 = 2x + 1$  is of the second degree or quadratic,  $x^3 - 3x^2 + 2x = 4$  is of the third degree or cubic, etc.

Equations may also be simple or simultaneous, i.e. two or more equations have to be solved at the same time to obtain more than one unknown, so that the solution is true for all the equations. The following is an example of a simultaneous equation

$$\begin{cases} 3x + 2y = 11 \\ x + 4y = 7 \end{cases}$$

**Factor** A quantity which will divide exactly into an expression, e.g.  $(x + 2)$  or  $(x + 1)$  is a factor of  $x^2 + 3x + 2$ , since this is also equal to  $(x + 1)(x + 2)$

**Factorial** A short way of writing the product of a simple series of numbers, e.g. factorial 5, written  $5!$  or  $5 \text{!}$  means  $5 \times 4 \times 3 \times 2 \times 1$

**Figurate Numbers** Arrangements of dots to represent a number and a geometrical figure, e.g. represents 4, and also a square

**Formula** An algebraic expression in which letters represent certain quantities and which can be worked out to a numerical result if numbers are written to replace the letters

**Fraction** An expression of the division of any one mathematical quantity

by another, e.g.  $\frac{3x + 4}{2x + 7}$ .

**Function** When one quantity  $y$  is connected in some way with another quantity  $x$ ,  $y$  is said to be a function of  $x$ , and is written  $y = f(x)$ . As the value of  $x$  is altered, the value of the functions alters

**Geometrical Progression** See PROGRESSIONS

**Graphs** The variation in value of a function may be represented on a diagram by means of a graph, which is a continuous line drawn through points plotted on squared paper, the position of the points being arranged with regard to two lines drawn at right angles to each other and called axes to represent the simultaneous values of two varying quantities. See also GEOMETRY

**Groups, Theory of** Analysis of the particular properties of a series of quantities which form a group by themselves

**Harmonic Progression** See PROGRESSIONS

**Identity** See EQUATION

**Imaginary Number** The square root of a negative quantity

**Index, Indices** When a quantity is raised to a power of itself, i.e. multiplied by itself a certain number of times, the power, i.e. the number of times it is so multiplied, is called an index. The theory of indices deals with the multiplication and division of such quantities

**Integer** A whole number, e.g. 7

**Interpolation** Inserting results in between results actually observed. Thus, if the temperature of a tank of cooling water be observed at hourly intervals, the temperature at intermediate times can be obtained by interpolation

**Involution** Multiplying a quantity by itself, e.g.  $a \times a \times a \times a = a^4$

**Least Squares** A method used for reducing errors in results obtained by experiment, and also applied to probability and error

*Linear Equation* See EQUATION

*Logarithms* If  $b^x = y$  then  $x$  may be said to be the logarithm of  $y$  to the base  $b$ . In ordinary logarithms the base is 10. Tables of logarithms have been drawn up and it is possible to multiply or divide two numbers by adding or subtracting their logarithms. Any required root of a number can also be found with the help of logarithms and the theory has very wide and important applications.

*Magic Square* An arrangement of numbers in a square so that they add up to the same total in any direction.

*Matrix* An arrangement of symbols in numbers in the form of a square.

*Maxima and Minima* The study of the greatest and least values of a variable function. See also CALCULUS.

*Mean Arithmetic* The arithmetic mean between two quantities is half their sum.

*Mean Geometric* The geometric mean between two quantities is the square root of their product. i.e. the g. mean of 2 and 8 =  $\sqrt{2 \times 8} = 4$ .

*Mean Harmonic* The harmonic mean between two quantities  $a$  and  $b$  is a quantity  $c$  such that  $c = \frac{ab}{a+b}$ .

*Multiplication* As in arithmetic two negative quantities when multiplied give a positive result e.g.  $-a \times -b = +ab$  but two quantities of different signs give a negative result e.g.  $a \times -b = -ab$ .

*Negative* See SIGN.

*Numbers Theory of* The study of positive and negative whole numbers and their properties.

*Number Sequence* Group of numbers arranged in a special order.

*Permutations* The number of ways in which a group of quantities can be arranged e.g.  $a, b, c$  or  $b, a, c$  etc. it is equal to factorial  $n$  where  $n$  is the number of quantities present.

*Polynomial* An algebraic expression consisting of several terms. A binomial contains two terms a trinomial three terms etc.

*Positive* See SIGN.

*Probability and Error* The study of the chance of a particular event happening e.g. the probability of a man living to a certain age concerns insurance companies.

*Progressions* The chief type of progressions are arithmetical, geometrical and harmonic.

*Arithmetical* A series of numbers each one differing from the next one by the same amount e.g. 1, 3, 5, 7 etc.

*Geometrical* A series of numbers each one of which bears a constant ratio to the next e.g. 4, 8, 16 etc.

*Harmonic* A series of quantities the reciprocals of which are in arithmetical progression e.g.  $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$  etc.

*Proportion* As in arithmetic. The ratio of a quantity  $a$  to a quantity  $b$  is  $\frac{a}{b}$  and if  $c$  and  $d$  are in the same pro-

portion  $\frac{a}{b} = \frac{c}{d}$ .

*Quadratic* An expression of the second degree.

*Quaternions* The algebra of vectors (q.v.).

*Ratio* See PROPORTION.

*Rational Number* Not an exact number e.g. the square root of 2 which is 1.414.

*Real Number* Any number which is not imaginary.

*Remainder Theorem* If in a quadratic expression e.g.  $2x^2 - x + 1$  the expression becomes 0 when  $x$  is put equal to a number say 3 then  $x - 3$  is a factor of the expression and the value if not 0 is the remainder which would result if the expression were to be divided by  $x - 3$ .

*Root* A root of an equation is the solution of the equation. See also ARITHMETIC. Evolution.

*Scalar* A quantity like length, time etc. which has only a certain value without having direction as does a force or a velocity.

*Sequence* See NUMBER SEQUENCE. See also NUMBER SEQUENCE and PROGRESSIONS.



**Sign** In algebra the idea of a negative quantity is introduced. Positive quantities are considered to be above 0 and negative quantities below 0. Thus the complete series of numbers is not 1, 2, 3, 4, but — 3, — 2, — 1, 0, 1, 2, 3, a negative number or quantity being denoted by a minus (—) sign in front of it.

**Simultaneous Equations** See EQUATIONS

**Square** A quantity multiplied by itself, e.g.  $b \times b = b^2$

**Square Root** That part of a quantity which, when multiplied by itself, gives the original quantity, e.g. the square root of  $b^2$  is  $b$ , since  $b \times b = b^2$

**Stirling Numbers** Particular sets of numbers named after their discoverer, Stirling

**Subtraction** As in arithmetic. To subtract quantities which differ in sign, that of the quantity to be subtracted is changed and the two quantities added, e.g.  $-2a$  subtracted from  $4a$  gives  $6a$

**Surd** An expression whose square root is not an exact number

**Term** One quantity in an expression which consists of several quantities connected by plus and minus signs, e.g. in the expression  $2x^2 - 3x + 7$ ,  $2x^2$  or  $-3x$  or  $7$  is a term

**Vector** A quantity such as force, velocity, etc., has a certain value as well as direction and position. Such quantities can be represented on a diagram by lines of certain length drawn to scale, and in their respective directions, and are called vector quantities or vectors

**Vector Analysis** The study of the addition, subtraction, multiplication, etc., of vector quantities. This has important applications in electrical theory

**Algeciras** [AL-JE-THE'-RAS] (*Algeiras*), town, S Spain, facing Gibraltar from W across the bay of Algeciras. Health resort in winter and fishing port. Spanish base for siege of Gibraltar, 1780–2. Pop. c. 20,000

**Algeciras Conference** (1905–1906), conference between England, France,

and Germany, called by the Sultan of Morocco at the instigation of the German emperor, who was alarmed at the French predominance in Morocco. It failed in its main object which was to undermine the privileged position of France, but some minor reforms were effected.

**Algeria**, a dependency of France in N Africa, between the Sahara Desert and the Mediterranean, and lying E of Morocco and W of Tunis. It is divided into 3 departments, Alger, Constantine, and Oran, and is governed as a part of France. The coastline is nearly 700 m long, and rocky, but even. Algeria is an elevated region (except for portions of the coastal edge) generally above 1500 ft, and occupied by the E extension of the Atlas Mountains, which here run in two parallel ranges, the Tell Atlas and Sahara Atlas (5000–7000 ft), with a high plateau between them. The rivers depend upon seasonal rainfall and are intermittent, the Shelif is the longest. Many rivers drain into depressions in the plateau and form saline lakes known as Shotts, others are lost in the Sahara sands, but a few of those in the N reach the Mediterranean. Area, 222,500 sq m

**Climate** Algeria has a hot, dry summer with heavy winter rainfall, decreasing in volume S to the almost rainless slopes of the Sahara Atlas. The coast strip is fairly temperate, but in summer Algeria is visited by the intolerably hot and dusty Sirocco

**Flora and Fauna** Vegetation conforms roughly to the three main geographical areas. The N slopes of the Tell Atlas are heavily forested, the valleys are very fertile, as are the narrow coastal lowlands. The central plateau is a steppe region. The Sahara Atlas is almost barren, with rocky slopes gradually descending to the desert. Wild animals are jackals, boars, hyenas, apes, occasional leopards, bears, and deer. Domestic animals are sheep, camels, and mules.

**Minerals** Iron, lead, zinc, copper, mercury, antimony, marble, onyx, and

kaolin are known to exist but have not yet been much exploited. The Romans quarried marble in the Numidian Atlas.

**Population (1931)** European 990 800 total 6 533 500 (Over 80 per cent of Europeans were of French nationality).

**Population and Production** The natives are principally Berber or Arabs but the stock has been debased especially in the N by the slave holding of their ancestors. The European colonists form about one sixth of the pop. and are mainly French citizens. The Jews of Algeria have also the privilege of French citizenship. The chief occupation is agriculture which is confined to the Tell region and the coast and generally directed by Europeans. Cereals (wheat barley oats and maize) flax cotton and tobacco (a valuable crop) are cultivated. Fruit is abundant (vine orange olive banana pomegranate fig and date). Wine is manufactured. Vegetables (potatoes artichokes tomatoes bean and peas) are grown. Most of Algeria however is forest or barren mountain. Forestry is important.

**Religion** The natives are mainly Mohammedans. The Roman Catholic Church in Algeria is organised under an archbishop and two bishops. The Jewish and Protestant clergy are subsidised by the French Government.

**Communications** Algeria is deficient in roads but there are about 3000 m of railway. Rail and road development is almost entirely confined to the N.

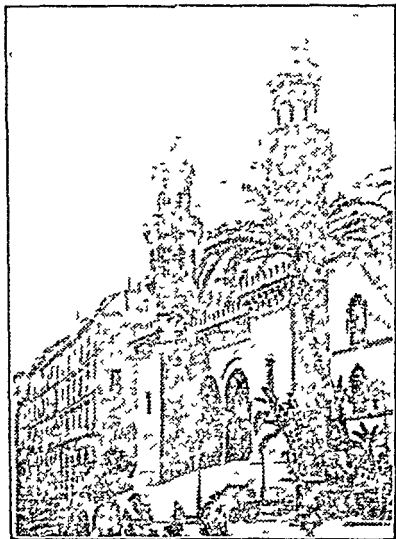
**Chief Towns** Algiers (57 000) the capital. Oran (163 700). Constantine (105 000). Bona (68 800) and Philippeville (47 700). Constantine is the largest inland town the others named are ports. Biskra lying inland is a popular holiday resort.

**History** Algeria has no history which can be distinctly marked off from the general story of Barbary (see below). A succession of Cartha-

ginian Roman Vandal and Arab conquest fills the early period. With the decline of the Berber power Spain under the direction of Cardinal Ximenes effected a lodgment at Oran in 1509 and at Algiers a year later. The corsair brothers Barbarossa overthrew the Spanish power in Algiers with the support of the natives of Algeria and did homage to the Ottoman Empire for their conquests. Oran was not finally lost to Spain until the end of the 18th cent. Algeria became almost independent under the Dey and proved on commerce until 1830 in spite of naval attacks by various European Powers including a British one in 1816 under Lord Exmouth. In 1830 following a dispute in which the French consul was insulted a powerful French expedition conquered Algiers. Although the Turkish power was destroyed the conquest of the native inhabitants proved a long and arduous task. After a period of vacillation Bugeaud commenced vigorous operations (1841-47) colonisation began the administration was reorganised and the marabout Abd-el Kader overthrown. The exigencies of French national politics hindered progress until 1881. Since that date the policy of assimilating Algiers to French civilisation has been successfully pursued and since 1898 the Governors General have been civilians.

**Alghero** [AL GA RO] port and convict station on the W coast of Sardinia. Prehistoric remains at Anghele Ruje c 6 m distant. Pop c 15 000.

**Algiers** [Fr 41 or] seaport and chief town of Algeria on W of the bay of Algiers. Important coaling station exports wool hides fruit grain vegetables and iron ore imports coal cotton goods and motor-cars. Second only to Marseilles among French ports for tonnage entered and cleared. Site of university and bishops see. Algiers is partly a modern city and partly an old Moorish town. Conquered by France in 1830 was for



Scene in Algiers

merly headquarters of piracy and slave trade in Mediterranean. Winter resort and headquarters of army corps. Pop (largely European) 257,000



Algiers The Quay

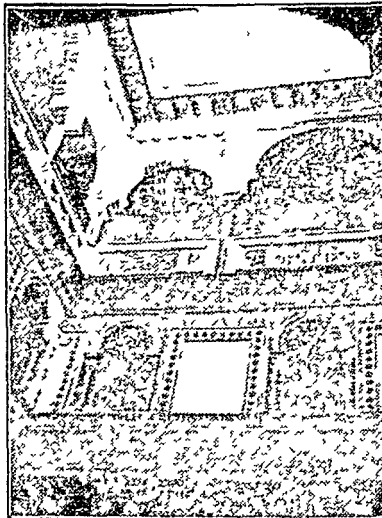
**Algoa Bay**, broad shallow indentation on S coast of S Africa at L angle between Capes Recife and Padrone. Port Elizabeth (*qv*) stands to SW of the bay. Diaz landed here in 1488, and British settlers built Port Elizabeth in 1820

**Algol** *see* CONSTELLATIONS

**Algonkian System**, *see* ARCHÆA SYSTEM

**Algonkin**, *see* RED INDIANS

**Alhambra**: (1) Moorish fortress-palace situated on an eminence SE of Granada, Spain. Built in 13-14th cent., and one of the noblest specimens of Moorish architecture, later damaged by Spanish conquerors and by an earthquake. Restoration begun 1821 by José Contreras, and continued by his son and grandson. Covers, with park, c 35 acres. (2) Well-known



alhambra (Granada)

London music-hall, in Leicester Square, its demolition was projected in 1933

**Ali** (*Ali Ben Abi Talib*) (c 600-661), fourth successor of Mohammed whose daughter Fatima he married. He became caliph in 650. Ali's son Hassan succeeded him on his assassination in 661, and is considered by the Shites as the last of the legitimate caliphs. The Turkish Moslems (Sunrites) abhor Ali's name, but the Persians (Shites) hold him second only to Mohammed, and pilgrimages to his tomb at Meshed Ali, 35 m South of

Babylon are made by them in celebration of his martyrdom

**Alias**, a name other than the baptismal or family name generally adopted for criminal purposes

**Alibi** [AL I bi] in criminal proceedings the defence that an accused person could not have committed the act with which he is charged because he was not present when it was committed

**Alicante** (1) Province S E Spain Mountainous in N and W sandy with oases in S and E near coast Salt marshes on coast Area over 9000 sq m Scanty rain fall irrigation carried on from Segura R and canals Vine and oranges the most important products Alicante wine is highly esteemed in Spain Cereals and olives also grown Sericulture important Hydrochloric nitric and sulphuric acids manufactured Pop 549 500 (2) Seaport of S L Spain and capital of the province of Alicante Exports vine fruit and esparto grass Manufactures textiles cigars and castor oil Good harbour Bishopric and health resort The town was stormed and taken by Admiral Byng in 1756 and surrendered to Charles III years later Pop (increasing) 74 000 in 1931

**Alice Springs**, telegraph station N Territory Australia situated in Macdonnell Ranges c half way between Adelaide and Port Darwin c 1900 ft above the sea climate extreme Mineral wealth in neighbourhood N S transcontinental railway now reaches here from Oodnadatta in S

**Alidade** [A LI D I de] instrument used in plane table surveying (q v)

**Alien**, a person who though present in one country is the subject of another In England an alien has in times of peace all the rights of a British subject v that he may not vote for a member of Parliament a member of the principal body nor sit in a British jury Under the Aliens

Act who wish to land in this country must obtain the permission of the immigration officer at the port of landing which will be refused if the alien is mentally deficient suffering from an incurable disease a criminal or so poor as likely to become a charge on the rates etc Aliens who wish to enter for the purpose of obtaining work must secure a permit from the Ministry of Labour Residential aliens must be registered with the police The Home Secretary may expel any undesirable alien more particularly if he has been convicted of a criminal offence and recommended by the judge for deportation See also NATIONALITY EXTRADITION

**Alienation** legal term denoting the transfer of real property by conveyance

**Aligarh** (1) District in Agra division of United Provinces British India between Rs Ganges and Jumna Area over 1900 sq m Pop c 1 000 000 (2) City of the above also called Kailash site of a Mahratta fortress dairy farming cotton pressing and flour milling In 1864 Sir S Ahmad Khan laid foundations here of what has since (1909) become a great Mohammedan university Introduction of Western methods as much opposed but Aligarh is now a great Mohammedan cultural centre Pop (1931) 67 000

**Alignment**, see STONE AGE

**Alimentary Canal**, see BOWELS

**Alimony** the allowance ordered by the court to be paid to a husband or wife by his or her spouse under a decree of divorce or judicial separation. No alimony will be ordered if the party applying for it has sufficient means of support

**Alington**, Cyril Argentine (b 1873) Headmaster of Eton (1916-33) Dean of Durham (1933) Previously an assistant master at Marlborough and headmaster of Shrewsbury (1908)

**Ali Pasha** (1811-1820) An Albanian soldier in the service of Turkey who was made Pasha of Janina 1788 He became very powerful in Albania and Greece and tried to make the former a sea power under the nominal suzerainty

of the Sultan He was murdered by the Sultan's orders in 1822

**Aliphatic Compounds.** Organic compounds are divided into two main classes, aliphatic and aromatic (*qv*). The aliphatic compounds are those in which the constituent atoms of the molecule are strung out in chain form instead of being grouped in a ring. All aliphatic compounds may be regarded as having been ultimately derived from the hydrocarbon methane,  $\text{CH}_4$ , whilst on the other hand aromatic compounds are derived from the hydrocarbon benzene,  $\text{C}_6\text{H}_6$ . The term aliphatic is derived from the fact that the compounds composing the natural fats belong to this series. It should, however, be noted that certain ring compounds which are not derived from benzene, as for instance the uric acid derivatives, are usually classed as aliphatic compounds, although strictly speaking they belong to the class known as hetero-cyclic compounds. *See also CHEMISTRY*

**Alisma** (*Water Plantain*), a hardy aquatic plant for ponds which can also be grown in small vessels indoors. The leaves all come from the root, and are broad below, tapering to a point, the purple flowers are borne in a compound panicle. The petals are delicate and soon fall.

**Alison, Sir Archibald, Bart** (1792-1867), advocate-depute for Scotland (1822), political and legal authority, published legal, historical, and political works. His *History of Europe* (1833-42) had a great reputation.

**Aliwal**, village in the Punjab, British India, on R. Sutlej. Scene of Sir Harry Smith's victory over the Sikhs in 1846.

**Aliwal North**, town on frontier of Cape Colony and Orange Free State, c. 300 m from E. London, on left bank of Orange R.; named after Sir H. Smith's victory at Aliwal, he being Governor of Cape Colony at the time of Aliwal North's foundation. On account of its elevation (4000 ft) and mineral springs the town has a growing reputation as a spa. Pop. over 6000.

**Alizarin** [ $\text{A-LI}'\text{-ZÄ-RIN}$ ] is the colouring principle of the madder root, where it is present in the form of a glucoside that is easily hydrolysed by acids or ferments to give alizarin. This source of alizarin has, however, now been completely superseded by the synthetic product derived from the anthracene in coal-tar.

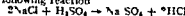
Chemically alizarin is 1,2-Dihydroxy anthraquinone,  $\text{C}_{14}\text{H}_8\text{O}_4(\text{OH})_2$ , having a melting-point of  $289^\circ\text{C}$  and a boiling-point of  $430^\circ\text{C}$ . Alizarin is widely used as a dye, being employed in the manufacture of Turkey red cloth and other fabrics.

Alizarin is a dye which requires the use of a mordant (*qv*), and the oxides of aluminium, chromium, and iron are used for this purpose, giving "lakes" of various shades of ruddy colour. *See also DYEING*

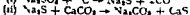
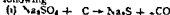
**Alkalhest**, an alchemical term signifying a liquid capable of dissolving everything, more particularly gold. Such a universal solvent is, of course, impossible to obtain, the nearest approach to it is aqua regia (*qv*).

**Alkali Industry.** The term alkali industry is generally used for that branch of the manufacture of "heavy chemicals" which deals with the alkalis of greatest industrial importance, namely, the hydroxides and carbonates of sodium, and, to a lesser degree, of potassium. The earliest method for the manufacture of alkalis was by igniting marine and land plants and treating the ash with water, this process gave sodium carbonate in the case of marine, and potassium carbonate in the case of land plants, and by treatment of these products with lime the corresponding hydroxides (caustic alkalis) were obtained. The principal use for these products in olden times was the manufacture of hard (sodium) and soft (potassium) soaps, the fat at first used being goat's tallow (*see SOAP*). The foundation of the modern alkali industry was laid in 1787, by a French chemist, Leblanc, whose process for the manufacture of alkali was in exclusive use for over a century.

The raw material of the Leblanc process is common salt which by heating with sulphuric acid is converted into sodium sulphate according to the following reaction



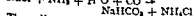
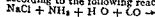
The sodium sulphate or salt-cake is then heated to about 500 °C. with a mixture of calcium carbonate (lime stone) and carbon (coal). Two reactions are here involved namely the formation of sodium sulphide and the conversion of the sulphide into sodium carbonate. These reactions are the following



The product that is obtained is known as *black-ash* it is broken up and mixed with water (lixivated) with the result that the sodium carbonate goes into solution whilst the calcium sulphide together with the excess of limestone and coal is left behind and is known as *alkali waste* the sulphur contained in this can be recovered if the economic conditions warrant it.

The hydrochloric acid that is liberated during the first reaction was in the early days of the process a waste product whose disposal was a considerable nuisance later however it was recovered by absorption in water and its importance as a by product is the chief reason for the operation of the Leblanc process at the present day.

The chief competitor of the Leblanc process and one that has largely replaced it is the Solvay Ammonia Soda process introduced in 186. In this process a concentrated solution of salt is saturated with ammonia gas the ammoniacal salt solution being then trickled through a tower in opposition to a stream of carbon dioxide gas the result is the formation of sodium bicarbonate and ammonium chloride according to the following reaction

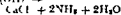
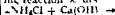


The sodium bicarbonate is precipitated from the solution and heated this causes it to lose carbon dioxide (which is recovered for use in the first stage of

the process) and water with the formation of sodium carbonate according to this equation



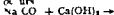
The ammonia solution that is left after the removal of the sodium bicarbonate is heated with slaked lime in order to recover the ammonia in gaseous form for re-use. The following reaction occurs



Sodium carbonate is obtained either in the anhydrous form  $\text{Na}_2\text{CO}_3$  (*soda ash*) or else as the crystalline decahydrate  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  (*washi q soda*) a monohydrate and a heptahydrate are also known. Sodium carbonate is used for a variety of purposes the chief being the manufacture of glass (*qv*) as a domestic detergent and as a source of other sodium compounds.

*Manufacture of Caustic Soda* Caustic soda (sodium hydroxide  $\text{NaOH}$ ) can be manufactured by electrolytic methods (*see* ELECTROCHEMISTRY) or from the sodium carbonate obtained by either of the two methods described above.

The manufacture of caustic soda from sodium carbonate is carried out by heating it in solution with slaked lime when the following reaction occurs



The calcium carbonate is almost insoluble and is filtered off and the caustic soda recovered by vacuum evaporation of the filtrate. All the water is removed and the caustic soda heated till it melts. It is then cast into sticks in which form it is met with in commerce.

The principal use of caustic soda is to hydrolyse fats for the manufacture of soap (*qv*). It is also used in the textile industry for the manufacture of artificial silk and the mercerisation of cotton.

During the processes outlined above both sodium sulphate and sodium bicarbonate are removed in certain quantities for use as such without

of the Sultan. He was murdered by the Sultan's orders in 1822.

**Aliphatic Compounds.** Organic compounds are divided into two main classes, aliphatic and aromatic (*q v*). The aliphatic compounds are those in which the constituent atoms of the molecule are strung out in chain form instead of being grouped in a ring. All aliphatic compounds may be regarded as having been ultimately derived from the hydrocarbon methane,  $\text{CH}_4$ , whilst on the other hand aromatic compounds are derived from the hydrocarbon benzene,  $\text{C}_6\text{H}_6$ . The term aliphatic is derived from the fact that the compounds composing the natural fats belong to this series. It should, however, be noted that certain ring compounds which are not derived from benzene, as for instance the uric acid derivatives, are usually classed as aliphatic compounds, although strictly speaking they belong to the class known as hetero-cyclic compounds. See also CHEMISTRY.

**Alisma** (*Water Plantain*), a hardy aquatic plant for ponds which can also be grown in small vessels indoors. The leaves all come from the root, and are broad below, tapering to a point, the purple flowers are borne in a compound panicle. The petals are delicate and soon fall.

**Alison, Sir Archibald, Bart** (1792-1867), advocate-depute for Scotland (1822), political and legal authority, published legal, historical, and political works. His *History of Europe* (1833-42) had a great reputation.

**Aliwal**, village in the Punjab, British India, on R. Sutlej. Scene of Sir Harry Smith's victory over the Sikhs in 1846.

**Aliwal North**, town on frontier of Cape Colony and Orange Free State, c. 300 m from E. London, on left bank of Orange R., named after Sir H. Smith's victory at Aliwal, he being Governor of Cape Colony at the time of Aliwal North's foundation. On account of its elevation (4000 ft) and mineral springs the town has a growing reputation as a spa. Pop. over 6000.

**Alizarin** [ $\text{Al-I'ZA-PIN}$ ] is the colouring principle of the madder root, where it is present in the form of a glucoside that is easily hydrolysed by acids or ferments to give alizarin. This source of alizarin has, however, now been completely superseded by the synthetic product derived from the anthracene in coal-tar.

Chemically alizarin is 1,2-Dihydroxy-anthraquinone,  $\text{C}_{14}\text{H}_8\text{O}_4(\text{OH})_2$ , having a melting-point of  $289^\circ\text{C}$ . and a boiling-point of  $430^\circ\text{C}$ . Alizarin is widely used as a dye, being employed in the manufacture of Turkey red cloth and other fabrics.

Alizarin is a dye which requires the use of a mordant (*q v*), and the oxides of aluminium, chromium, and iron are used for this purpose, giving "lakes" of various shades of ruddy colour. See also DYEING.

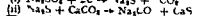
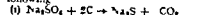
**Alkahest**, an alchemical term signifying a liquid capable of dissolving everything, more particularly gold. Such a universal solvent is, of course, impossible to obtain, the nearest approach to it is aqua regia (*q v*).

**Alkali Industry.** The term alkali industry is generally used for that branch of the manufacture of "heavy chemicals" which deals with the alkalis of greatest industrial importance, namely, the hydroxides and carbonates of sodium, and, to a lesser degree, of potassium. The earliest method for the manufacture of alkalis was by igniting marine and land plants and treating the ash with water, this process gave sodium carbonate in the case of marine, and potassium carbonate in the case of land plants, and by treatment of these products with lime the corresponding hydroxides (caustic alkalis) were obtained. The principal use for these products in olden times was the manufacture of hard (sodium) and soft (potassium) soaps, the fat at first used being goat's tallow (see SOAP). The foundation of the modern alkali industry was laid in 1787, by a French chemist, Leblanc, whose process for the manufacture of alkali was in exclusive use for over a century.

The raw material of the Leblanc process is common salt which by heating with sulphuric acid is converted into sodium sulphate according to the following reaction



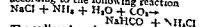
The sodium sulphate or salt-cake is then heated to about  $1000^\circ\text{C}$  with a mixture of calcium carbonate (limestone) and carbon (coal). Two reactions are here involved namely the formation of sodium sulphide and the conversion of the sulphide into sodium carbonate. These reactions are the following



The product that is obtained is known as *black-ash*. It is broken up and mixed with water (lixiviated) with the result that the sodium carbonate goes into solution whilst the calcium sulphide together with the excess of limestone and coal is left behind and is known as *alkali waste* the sulphur contained in this can be recovered if the economic conditions warrant it.

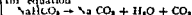
The hydrochloric acid that is liberated during the first reaction was in the early days of the process a waste product whose disposal was a considerable nuisance. Later however it was recovered by absorption in water and its importance as a by-product is the chief reason for the operation of the Leblanc process at the present day.

The chief competitor of the Leblanc process and one that has largely replaced it is the Solvay Ammonia Soda process introduced in 1865. In this process a concentrated solution of salt is saturated with ammonia gas the ammoniacal salt solution being then trickled through a tower in opposition to a stream of carbon-dioxide gas the result is the formation of sodium bicarbonate and ammonium chloride according to the following reaction

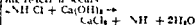


The sodium bicarbonate is precipitated from the solution and heated thus loses carbon dioxide (which is for use in the first stage of

the process) and water with the formation of sodium carbonate according to the equation



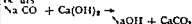
The ammonia solution that is left after the removal of the sodium bicarbonate is heated with slaked lime in order to recover the ammonia in gaseous form for re-use. The following reaction occurs



Sodium carbonate is obtained either in the anhydrous form  $\text{Na}_2\text{CO}_3$  (*soda ash*) or else as the crystalline decahydrate  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  (*washing soda*). A monohydrate and a half-hydrate are also known. Sodium carbonate is used for a variety of purposes the chief being the manufacture of glass (*qv*) as a domestic detergent and as a source of other sodium compounds.

**Manufacture of Caustic Soda.** Caustic soda (sodium hydroxide  $\text{NaOH}$ ) can be manufactured by electrolytic methods (*see* ELECTROCHEMISTRY) or from the sodium carbonate obtained by either of the two methods described above.

The manufacture of caustic soda from sodium carbonate is carried out by heating it in solution with slaked lime when the following reaction occurs



The calcium carbonate is almost insoluble and is filtered off and the caustic soda recovered by vacuum evaporation of the filtrate. All the water is removed and the caustic soda heated till it melts. It is then cast into sticks in which form it is met with in commerce.

The principal use of caustic soda is to hydrolyse fats for the manufacture of soap (*qv*). It is also used in the textile industry for the manufacture of artificial silk and the mercerisation of cotton.

During the processes outlined above both sodium sulphate and sodium bicarbonate are produced in small quantities.



undergoing further conversion Sodium sulphate (Glauber's salt) is principally used in the manufacture of glass and as a mordant in dyeing, and the bicarbonate is employed in medicine and in the manufacture of baking powders. It is also used as a source of carbon dioxide for aerated beverages. *See also* SODIUM, POTASSIUM

**Alkali Metals** This term is applied to the group of metals whose hydroxides have strong alkaline properties. The important alkali metals are sodium and potassium, other members of the group (of little or no industrial importance) are lithium, caesium, rubidium, and element No. 87 (francium). *See* separate articles

**Alkalimetry** [*pron* ALKALI-METRI], *see* CHEMICAL ANALYSIS

**Alkaline Earths** These comprise the oxides of certain metals in the second group of the periodic classification (*qv*). The term was originally conferred on lime and magnesia, owing to their alkaline properties, and was afterwards extended to include the oxides of chemically similar metals. The alkaline earth metals comprise the following (*qv*) beryllium, magnesium, calcium, strontium, barium, and radium.

**Alkalis** may be defined as substances which have the power of neutralising acids and turning litmus blue, with similar effects on other indicators. The term is, however, more habitually restricted to the hydroxides of the alkali metals (*qv*), and also to the hydroxides of the alkaline earth metals (*qv*). Ammonium hydroxide is also sometimes included in the term alkali (*see* ALKALI INDUSTRY).

**Alkaloids** It is somewhat difficult to give a hard-and-fast definition of an alkaloid, but, in general, it may be said to be a basic compound (i.e. one having salt-forming properties) of vegetable origin, in which at least one nitrogen atom forms part of a ring system. The alkaloids are mostly of a complex structure, and the majority of them have marked physiological properties. They are usually found in

the fruits, seeds, or barks of plants, and are obtained by extraction of the ground material with acidulated water and precipitation of the alkaloid from the extract by the addition of alkali. The alkaloid is then purified by successive re-crystallisations.

Although the medicinal and poisonous properties of various plants have been known to mankind for centuries, it is only a little over a century since the first alkaloid was isolated in a state of purity, and our chemical knowledge of these substances dates from that time.

There are several hundreds of alkaloids known to science, but of these not more than a couple of dozen are put to any use, and these chiefly as medicines and vermin-killers.

Perhaps the most important alkaloid is *quinine*, which is obtained from the bark of trees of the *Cinchona* species. These trees are natives of S. America, but they have been acclimatised in Java, whence most of the world's supply of quinine now comes. The use of quinine as a febrifuge dates from the 17th cent., when the Countess of Chinchon, the wife of the Viceroy of Peru, was cured of fever by the administration of cinchona bark, hence the name.

Another important group of alkaloids are those derived from *opium*, which is the juice obtained from the heads of unripe poppies. There are a great number of alkaloids present in opium, the principal of which is *morphine*, which is used in medicine for deadening pain. Morphine is responsible for the principal effects of opium-smoking. *Heroin*, which is much used by drug addicts, is a derivative of morphine (diacetyl morphine). *Apomorphine*, another opium alkaloid, is an extremely powerful emetic, and is given by injection. *Codeine* is another opium alkaloid, its physiological action being similar to that of morphine.

*Cocaine* is used medicinally as a local anaesthetic, chiefly in eye surgery. Cocaine is a temporary stimulant, and is used as such by drug addicts and by

the natives of western S America who chew coca leaves (whence the drug is obtained). If taken by the mouth cocaine anaesthetises the stomach lining and thus removes all feeling of hunger. Many other alkaloids are used in ophthalmic medicine for their mydriatic (dilation of the pupil) powers. The chief of these is *atropine* which is artificially prepared from *hyoscyamine* and *hyoscyne*. The latter substance is much used as a sedative and is the material that produces twilight sleep—the form of light anaesthesia used to mitigate the pains of child birth.

The most powerful aphrodisiac known is believed to be *yohimbine*—an alkaloid obtained from the bark of a W African tree. This substance is also poisonous.

Nearly all the alkaloids are poisonous if taken in sufficient quantity, but some are extremely toxic even in very small doses. Such a one is *strychnine* which is obtained from various plants. In small amounts it is used as a stimulant.

An extremely poisonous alkaloid is to be found in *cuba e* which is a vegetable poison used by S American Indians for tipping arrows.

One of the alkaloids with which most people come frequently in contact is *caffeine* which is to be found in tea and coffee. It is a stimulant. A similar substance *theobromine* is the active constituent of cocoa.

A fungus that yields an alkaloid is *ergot* which contains the active principle *ergotrine*. Ergot is a parasite of rye and is responsible for the periodical outbreaks of ergotism that occur among populations eating bread manufactured wholly or largely from rye flour. Ergot is of value medically owing to its specific action on the uterine muscle which it causes to contract. This action has given ergot a popular reputation as an abortifacient, actually it is of but little value as such but is employed in obstetrics to arrest haemorrhage.

Whilst most alkaloids are solid crystalline bodies a few are liquid

such for instance as *nicotine*—a very toxic substance obtained from the leaves of tobacco. Nicotine is used to a considerable extent as an insecticide. Another liquid alkaloid is *coniine* which is the active principle of the poisonous hemlock plants. It is of interest as being the first alkaloid prepared synthetically (1836).

An alkaloid obtained from a common English plant is *aconitine* which is to be found on the monk's blood or wolfbane. The drug is used in medicine to diminish pain as in cases of neuralgia and also as a depressant of the heart's action.

**Alkanet** *Ikanna tinctoria* plant of the Boraginaceae family, the root yields a red dye. The garden representative is the *Anchusa* 4 ft border plants with spikes of blue flowers like large forget-me-nots.

**Al Khwarazmi** (fl. 9th cent.) Arabian mathematician who wrote several works, including *al Jabr ual Muqabala* dealing with Hindu arithmetic and quadratic equations. The first two words of its title were corrupted into *Algebra* by which name a section of mathematics is now known.

**Al Kindi** (fl. 9th cent.) Arabian mathematician and philosopher who translated Aristotle and has been called the father of Arabian philosophy.

**Alkmaar** (AL-KMAAR) Dutch town on coast of N Holland. An old settlement who trade developed with the drainage of marshes. Centre of trade in dairy produce. In 1799 a Russo-British army was forced to sign a convention here ceasing the Netherlands after successful operations against the French. Pop. (1930) 8,000.

**Allahabad** (1) city of British India at junction of Jumna and Ganges. Capital of United Provinces of Agra and Oudh. Holy city of Hindus. Railway centre. Great annual pilgrimages and fairs. Many antiquities including one of Asoka's pillars. The scene of an heroic defence and some of the worst excesses of the Indian Mutiny. Pop. (1931) 183,900. (—)

Division of United Provinces on the Gangetic plain, including the fertile angle between Ganges and Jumna. Boundaries rather irregular, includes districts of Cawnpore, Allahabad, Fatehpur, Farrukhabad, and Etawah. Area c 10,500 sq m. Pop. nearly 4,800,000.

**Allan, David** (1744-1796), Scots painter and illustrator, was an apprentice of Robert Foulis. He became known as the "Scottish Hogarth," and was appointed director of the Trustees' Academy, Edinburgh (1786).

**Allan, Sir Hugh** (1810-1882), founded the Allan Steamship Line, and helped to promote the Canadian Pacific Railway.

**Allan, Sir William, RA** (1782-1850), Scots painter of historical and Russian subjects, which he noted while in Russia (1805-14), studied at the Trustees' Academy, Edinburgh.

**Allbutt, Sir Thomas Clifford** (1836-1925), physician, known for his studies of nervous pathology and the invention of the short clinical thermometer.

**Allegheny, river** in USA, chief tributary of the Ohio. Rises on plateau in Potter County, Pennsylvania, and joins the Monongahela to form the Ohio at Pittsburgh, Pa. Length over 300 m.

**Allegheny Mountains**, name applied to whole or part of the Appalachian Chain in E of USA. At present the name is generally given to the chain S and W of the Hudson R and specifically to ridges confronting the Blue Ridge in centre of the chain. *See also* APPALACHIAN MOUNTAINS.

**Allegiance**, the duty owed by a subject or citizen of a State to the State, in return for its protection. *See also* NATIONALITY, NATURALISATION.

**Allegory**, a metaphorical form of narrative in which a deeper, and usually moral, significance underlies the superficial and obvious story. Bunyan's *Pilgrim's Progress* is a supreme example. It differs from a parable, in that the latter is more concise and inculcates a single lesson or principle. Fable differs from both

these in being a narration of physically impossible events, such as the conversation of animals and inanimate objects.

**Allegri [AL-LA'GRE] Gregorio** (1584-1662), Roman musician, whose *Miserere* for nine voices is sung in the Sistine Chapel during Holy Week.

**Allen, Charles Grant Blairfindie (Grant Allen)** (1848-1899), English author, born in Canada, wrote scientific works (especially on Evolution), including *The Evolution of the Idea of God*, and novels (e.g. *The Woman who Did*).

**Allen, Sir Hugh Percy** (b 1869), succeeded Sir Hubert Parry as Director of the Royal College of Music (1918), and Sir Walter Parratt as Professor of Music at Oxford (1918). As organist of New College, Oxford, he gave a great stimulus to University music, and also became conductor of the Bach choir.

**Allen, William** (1532-1594), English cardinal. Founded English seminary at Douai (1568) and inspired the publication of the Douai Bible.

**Allen, Bog of**, name given to a series of morasses occupying the central district of Irish Free State, in Westmeath, Kildare, Offaly, and Leri. Rs. Boyne, Brosna, and Barrow have their sources in the swamps.

**Allen, Lough**, lake in Irish Free State through which the upper course of the Shannon drains. It divides co. Roscommon from co. Leitrim. It is c 5 m long and 3 m broad.

**Allenby, Edmund Henry Hynman, 1st Viscount** (b 1861), British field-marshal, entered the Army from Sandhurst in 1882, and served in the S. African War (1899-1902). In the World War Allenby commanded the Cavalry Division in France in 1914, and the 3rd Army in 1915-17, taking part in the battle of Arras. In June 1917 he was appointed commander-in-chief of the Egyptian Expeditionary Force. During the autumn of 1917 he captured Gaza and Beersheba, and on Dec 11 entered Jerusalem. His greatest achievement was the defeat of the Turkish Army at the battles of Megiddo (1918). He later served as

High Commissioner in Egypt (1919-22) during a particularly difficult period

**Allenstein Marienwerder** a district of Germany constituted after a plebiscite provided for by the Treaty of Versailles 1918 composed of a number of districts (*Kreise*) of the old Prussian provinces of E and W Prussia which were not ceded to Poland by the peace settlement The E Prussian areas are divided from those of the W by the Polish Corridor

**Alleppey (Alleppi)** port on the Malabar coast of India in the state of Travancore Has a fine harbour and is the commercial and industrial centre of Travancore Exports cardamoms pepper coffee copra and coco nuts Pop 30,000

**Allergy** a state of the human body in which the system is particularly sensitive to certain substances Some people cannot eat certain foods e.g. eggs or shell fish without suffering from ill-effects Such people are said to be allergic towards eggs or shell fish. Similarly others cannot breathe in the pollen from grass or flowers without at once suffering from hay fever They are allergic towards pollen. The number of things to which persons may be allergic is almost unlimited The late Lord Roberts was unable to stay in the same room with a cat without feeling ill Others cannot enter a stable or a green house for similar reasons

The usual form which the illness takes when the sensitising agent be it pollen or dust is breathed in by the allergic person is a form of asthma But the form taken when the sensitising agent is eaten is usually diarrhoea or colitis In both cases the reaction is spoken of as anaphylaxis Most people are capable of receiving injections of serum for therapeutic purposes without any ill-effects. But some are definitely allergic to certain kinds of serum and suffer from serum sickness This anaphylaxis usually takes the form of a sharp rise in temperature and the appearance of a rash the condi-

tion being known as anaphylactic shock

**Alleyn, Edward** (1566-1606) actor founded Dulwich College in 1613 He retired from the stage in 1604 after acquiring great wealth and fame

**All Fools Day** has been observed on April 1 as a day for resorting to all sorts of tricks in order to make one's friends appear foolish The custom became general in England early in the 18th cent but its origins though obscure are very much older It is probably connected with the festivities in celebration of the New Year at the spring equinox An April fool is called in France *un poisson d'avril* (April fish)

**All Hallows Tide**, a popular name for the festival of All Saints (*q.v.*) With All Hallow-e-en (the night of Oct 31) many superstitious beliefs of visits of the devil to earth etc are connected in popular folklore

**Allia**, now *Fosso D'Anagni* a small left bank tributary of the Tiber scene of one of Rome's greatest military disasters in 390 B.C. when its army was overwhelmed by the Gauls

**Alliance** a voluntary union or league between nations usually contracted by treaty and directed to some specific end In 1634 the Triple Alliance between Great Britain Sweden and the Netherlands was formed to counterbalance the power of Louis XIV and for a long time alliances were made upon this principle (*see* BALANCE OF POWER) each ally being pledged to help the others in case of aggression *See also* WORLD WAR

**Allier** (1) Department of France formed from the former district of Bourbonnais situated on the N edge of the central plateau an elevated region 800-1500 ft traversed by numerous head streams of the Loire Area 848 sq m Climate is rather extreme and severe in winter Products chiefly cereals fruit and potatoes sheep goats and pigs are reared in the forests and high pastures Coal seams

Almeida, town on the Cõa, N E Portugal, near the Spanish frontier. Formerly an important fortress. Centre of Wellington's 1811 campaign against Massena, which culminated in the battle of Fuentes de Oñoro, and the capture of Almeida. Pop 1600

Almeida, Francisco de (c 1450-1510), first Portuguese Viceroy in India appointed in 1505. He was succeeded by Albuquerque (q v), and on the way back to Lisbon he was killed in a skirmish at the Cape of Good Hope

Almelo, Dutch town in the province of Overijssel, manufactures textiles and linen yarn. Pop (1932) 33,000

Almeria [AL-ME-RE'-A]. (1) Province of S E Spain, surface is irregular. N W occupied by extremity of Sierra Nevada and its offshoots. Productions, esparto and fruit (especially grapes). Minerals include lead, iron, and sulphur. Area 3390 sq m, pop (1931) 339,000. (2) Town, capital of province with same name. Fine harbour, of importance since Roman times. Exports fruit, esparto, lead and iron, imports oil-fuel and timber. Considerable Moorish ruins. Pop (1931) 54,400

Almohades (*Muwahhads*), members of a Mohammedan religious movement which established the fifth Moorish dynasty and dominated N Africa and Moslem Spain. The founder, Ibn Tumart (d 1128), was a religious reformer in Morocco, and was succeeded by Abd-el-Mumin, who became Amir of Morocco, 1149. The Muwahhads adopted Seville as their capital in 1170. But in 1212 Mohammed III was defeated by the princes of Spain and Portugal, and the dynasty ended with Idris IV (d 1269)

Almond Oil. This expression is applied to two entirely different substances, though they are both derived from the almond. The fatty or "sweet" almond oil is obtained by the expression (or extraction) of the kernels of the almond (*Prunus amygdalus*). Either the sweet or bitter almond may be employed, the oil from both being almost identical. The oil

is a semi-drying fatty oil, and is used in pharmacy as a vehicle for drugs and in the preparation of face-creams and other cosmetics. The genuine oil is somewhat expensive, and the almond oil that is met with often in reality consists of the kernel oil from other members of the *Prunus* family, such as the peach, apricot, and plum.

The other substance to which the term almond oil is applied is "bitter" almond oil, an essential oil obtained from the ground kernels of bitter almonds after they have been freed from fatty oil, the essential oil is obtained by distillation. The oil contains benzaldehyde and hydrocyanic acid, the latter, unless removed, makes the oil toxic. These two constituents are present in the oil, combined together in the form of a glucoside, *amygdalin* (q v). This latter is decomposed during the fermentation that precedes the distillation of the essential oil. Bitter almond oil (freed from hydrocyanic acid) is employed as a flavouring material and for some medicinal purposes (see *HYDROCYANIC ACID*). A considerable amount of the bitter "almond oil" of commerce is in reality obtained from the kernels of apricots

Almond Tree, belongs to the same group of the family Rosaceæ as the peach, plum, cherry, and cherry-laurel. *Amygdalus communis*, the Common Almond, is a native of Barbary, and was introduced into England before 1548. Its pink blossom is produced in April. The varieties of almond are increased by budding upon seedling plum stocks. They are cultivated in the S of Europe for their fruit. Almost any soil suits them. For early forcing they are very effective established in pots a year before, they require very little heat

Almora: (1) District, Kumaon Province, in N of United Provinces British India. Situated among foothills of Himalaya (Kumaon Mountains), between upper courses of Gogra and Ganges. Area 5400 sq m, pop c 530,000. (2) Town in above, or

lofty ridge 5,000 ft above the sea. Military sanatorium. Scene of conclusive British victory in Gurkha War (1815). Pop c 8500.

**Almshouse** a house built by private charity for poor and aged persons. The oldest example in England dating from 1136 is that of St Cross at Winchester. In the 16th-18th cents it was common for the squire or lord of the manor to present an almshouse to the village.

**Alnwick** market town Northumberland, England. William the Lion King of Scotland was captured in a skirmish nearby in 1174. The castle (much restored) has been since 1300 the seat of the Percy family. Pop c 1,000.

**Aloe**, see AGAVE.

**Aloes Wood** (*Eagle Wood*) the resinous wood of *Aquilaria agallocha*.

**Alopecea**, see BEAUTY CULTURE.

**Alost**, town in E. Flanders formerly capital of district (Imperial Flanders) which was a fief of Holy Roman Empire while most of Flanders was subject to France. Hop-growing centre. Pop 38,800.

**Aloysius, St. (Luigi Gonzaga)** (1568-1591) forsook his marquessate to take orders and became a Jesuit. When attending plague patients in Pome in 1591 he fell a victim to the malady himself. He was canonised in 1746 and is recognised as patron saint of youths by the Roman Catholic Church. Feast June 21.

**Alpaca**, a domesticated breed of llama (*qr*) found in Peru, Bolivia and Chile and probably derived from the wild guanaco. Its chief use is in its luxuriant woolly fleece which may be 6 ft in length. It is usual to remove about 8 in of this when shearing. The wool is mainly black to dark brown lustrous silky and fine. It is used for the manufacture of cloth. Alpaca wool was introduced into England as a commercial product in 1830.

**Alpes Basses**, see BASSES ALPES.

**Alpes, Hautes** see HAUTES ALPES.

**Alpes Maritimes**, department in S.E. France on Italian frontier.

Formed from the ancient county of Nice with the addition of districts of Grasse and Mentone. Part of the price of French assistance in Italian War of Liberation. Interior hilly or mountainous (Mount Tinibras 930 ft). Watered by R Var. Includes most of French Riviera. Chief town Nice. Area 1442 sq m. pop (1931) 493,400.

**Alphabet** The written and printed letters, hi c mpo, which called from the first Greek letters the alphabet provide a rough and imperfect means of representing speech sound graphically. Practically every alphabet that exists or has existed is necessarily imperfect simply because the sound of human speech is so many that it is not practicable to assign a separate and easily distinguishable symbol to each of them and consequently one and the same symbol has frequently to do duty for two or more sounds (e.g. the *a* in *path*, *pat*, *pa*, *pass*). That is to say the alphabet as we know it now is a highly conventionalised form of writing the letters of which have hardly any inherent relation to the sound which they represent. But this was not the case with the earliest form of writing from which our alphabet is believed to have been derived.

The earliest form of alphabet with which we need concern ourselves consisted of a direct representation of objects or ideas by means of pictures and such pictographs are known to have been used by many primitive peoples. It was from such origins that the Babylonian and Assyrian cuneiform writing, the modern Chinese characters and the Egyptian hieroglyphs were developed. It is not very difficult to understand how a conventional alphabet was gradually evolved from such picture writing. The sound or the most prominent sound of a word represented by a pictograph came to be represented by that pictograph or a later development of it when it occurred in other words. Furthermore the pictographs themselves in the course of time departed

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**Almeria** [AL-ME-RE'-A]: (1) Province of S E Spain, surface is irregular. N W occupied by extremity of Sierra Nevada and its offshoots. Productions: esparto and fruit (especially grapes). Minerals include lead, iron, and sulphur. Area 3390 sq m, pop (1931) 339,000. (2) Town, capital of province with same name. Fine harbour, of importance since Roman times. Exports fruit, esparto, lead and iron, imports oil-fuel and timber. Considerable Moorish ruins. Pop (1931) 54,400.

**Almohades** (*Muwahhads*), members of a Mohammedan religious movement which established the fifth Moorish dynasty and dominated N Africa and Moslem Spain. The founder, Ibn Tumart (d 1128), was a religious reformer in Morocco, and was succeeded by Abd-el-Mumin, who became Amir of Morocco, 1149. The Muwahhads adopted Seville as their capital in 1170. But in 1212 Mohammed III was defeated by the princes of Spain and Portugal, and the dynasty ended with Idris IV (d 1269).

**Almond Oil**. This expression is applied to two entirely different substances, though they are both derived from the almond. The fatty or "sweet" almond oil is obtained by the expression (or extraction) of the kernels of the almond (*Prunus amygdalus*). Either the sweet or bitter almond may be employed; the oil from both being almost identical. The oil

is a semi-drying fatty oil, and is used in pharmacy as a vehicle for drugs and in the preparation of face-creams and other cosmetics. The genuine oil is somewhat expensive, and the almond oil that is met with often in reality consists of the kernel oil from other members of the *Prunus* family, such as the peach, apricot, and plum.

The other substance to which the term almond oil is applied is "bitter" almond oil, an essential oil obtained from the ground kernels of bitter almonds after they have been freed from fatty oil; the essential oil is obtained by distillation. The oil contains benzaldehyde and hydrocyanic acid, the latter, unless removed, makes the oil toxic. These two constituents are present in the oil, combined together in the form of a glucoside, *amygdalin* (qv). This latter is decomposed during the fermentation that precedes the distillation of the essential oil. Bitter almond oil (freed from hydrocyanic acid) is employed as a flavouring material and for some medicinal purposes (see HYDROCYANIC ACID). A considerable amount of the bitter "almond oil" of commerce is in reality obtained from the kernels of apricots.

**Almond Tree**, belongs to the same group of the family Rosaceæ as the peach, plum, cherry, and cherry-laurel. *Amygdalus communis*, the Common Almond, is a native of Barbary, and was introduced into England before 1548. Its pink blossom is produced in April. The varieties of almond are increased by budding upon seedling plum stocks. They are cultivated in the S of Europe for their fruit. Almost any soil suits them. For early forcing they are very effective, established in pots a year before, they require very little heat.

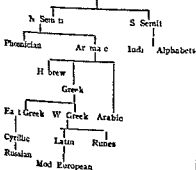
**Almora**: (1) District, Kumaon Province, in N of United Provinces, British India. Situated among foothills of Himalaya (Kumaon Mountains) between upper courses of Gogra and Ganges. Area 5400 sq m; pop c 530,000. (2) Town in above, on

Table II

HIEROGLYPHS EGYPTIAN

Hieroglyphic Egyptian

Origin Semitic



See also ETHNOLOGY

**Alpha Particles** a type of radiation given off by radioactive elements. They are the least penetrating of the radioactive radiations and have been shown to consist of a helium atom that is positively charged (i.e. that has lost one or two electrons). Their paths were first traced by C. T. R. Wilson in 1919. See also ATOM RADIOACTIVITY

**Alpheus** [AL-FE-ŪS] modern Ruphia principal river of the Peloponnese. Greece rises in Arcadia and flows past Olympia into the Ionian Sea. The waters of the river (identified with the river god) are traditionally said to reappear in the fountain of Arethusa at Syracuse.

**Alpine Club** mountaineering club established in 1857. The club premises are in Savile Row, London. It has published *The Alpine Journal* since 1863. Most famous mountaineers have been members or honorary members of the club.

**Alpine House** a greenhouse devoted to the cultivation of Alpine plants. While any greenhouse can be converted into an Alpine house there are special constructions with a low and wide expanse of roof so as to ensure

the maximum of light. As the chief difficulty is to maintain a perfect state of moisture the tight lined with metal or slate upon which is placed a few inches depth of fine gravel or similar material which is kept well moistened. The pots and pans are plunged into or stood upon this stony layer. Thus there is always a supply of aerated moisture for the roots to draw upon obviating a too frequent watering application to plants and soil. No heat is necessary although a small oil stove or lamp will prevent abnormal lowering of temperature in cold weather through the admittance of the essential air.

**Alpine Plants** These are a distinct race of plants that grow in high altitudes and are usually dwarf in stature many of them being miniature replicas of the ordinary garden kind. The special culture required by some of them is treated under ALPINE HOUSE (q.v.). Most Alpine plants can be grown in the rock garden under the right cultural conditions.

**Alpini Prospero** (1833-1917) Italian botanist conducted research on Egyptian palm trees. He became Professor of Botany at Padua in 1893.

**Alpinism**, see MOUNTAINEERING

**Alps Australian** section of Great Dividing Range in States of Victoria and New South Wales in S.E. Australia. Length c. 300 m. Range is very broad and practically a plateau. Culminating point Mount Kosciuszko (7310 ft.) the highest summit in Australia.

**Alps The** mountain range in S.E. France, N. Italy, Switzerland and Austria and reaching into Yugoslavia. They form the principal mountain system in Europe and are very largely above the limits of perpetual snow including some of the most beautiful glaciated peaks and ranges in the world. There is no all-mated water parting throughout the range which consists of a series of locally parallel ranges with deeply eroded valleys between them affording a number of easy passes across the chain which has never been such an obstacle



more and more from their original form, grew more and more conventional, and finally became *letters* in the modern sense of the term. Thus, it is believed, the Egyptian hieroglyphic writing developed into the more conventionalised hieratic writing, which was the parent from which the oldest form of Semitic alphabet was born, though it is admitted that the earliest origins of the Semitic alphabets are more than a little obscure. But there is no doubt about the development of nearly every Indian and European alphabet from the early Semitic. We do not yet know exactly how the Greeks got their alphabet from the Semites, but we do know that the various alphabets of the Indo-European and Semitic languages have a common origin, and that the modern European alphabets are derived, either through Latin or directly, from the Greek alphabet.

In the accompanying Table-I the development of the modern English

Table I

ENGLISH	LATIN	GREEK	EARLY GREEK	INDO-EUROPEAN
A	A	Α	Α	Α
B	B	Β	Β	Β
C	C	Γ	Γ	Γ
D	D	Δ	Δ	Δ
E	E	Ε	Ε	Ε
F	F	Φ	Φ	Φ
G	G	Γ	Γ	Γ
H	H	Η	Η	Η
I	I	Ι	Ι	Ι
J	J	Ι	Ι	Ι
K	K	Κ	Κ	Κ
L	L	Λ	Λ	Λ
M	M	Μ	Μ	Μ
N	N	Ν	Ν	Ν
O	O	Ο	Ο	Ο
P	P	Π	Π	Π
Q	Q	Ο	Ο	Ο
R	R	Ρ	Ρ	Ρ
S	S	Σ	Σ	Σ
T	T	Τ	Τ	Τ
U	U	Υ	Υ	Υ
V	V	Υ	Υ	Υ
W	W	Ω	Ω	Ω
X	X	Ξ	Ξ	Ξ
Y	Y	Ψ	Ψ	Ψ
Z	Z	Ζ	Ζ	Ζ

alphabet is traced through the Latin, Greek, and Semitic (taking Phoenician as an example of the last). In Table I an attempt is made to show the inter-relationship of the chief Indo-European and Semitic alphabets.

*Notes to Table I.* The order of the letters has been made to correspond with that of the Greek alphabet. The Greek B is the parent of two letters in the Russian alphabet.

(i) B = v, (ii) B = b

The Greek F developed regularly into C. A stroke was added to this to differentiate G.

H is originally in Semitic a sort of aspirate or breathing, and has survived as such in English. In Greek it had the value of long e.

J is merely an extended form of I.

The stroke was added to R to differentiate it from P, with which it was at one time identical in form.

U and Y are historically the same. V is merely an alternative form of U, and W is a reduplicated form of V.

The history of X is not very clear. In Greek it had the value of *ch* in *loch*, but it appears to have the same ultimate source as the Greek letter (*ks*), which represents its modern European value.

F (a labio-dental fricative in English) is derived from the *digamma* (doubtful) F, which was a bi-labial fricative having a sound something like the English *w*, but more like the Spanish *b* and *v*.

Q from the Greek Q (*koppa*) has originally a sound value of its own independent of U. It was like the first sound in the word *cool* as distinguished from that in the word *heel*.

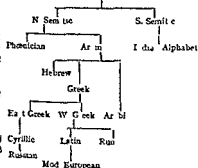
*Note*—An excellent work to consult in spite of its being a little out of date is the 1899 reprint of Isaac Taylor's *T. Alphabet* (1883). Edward Clodd's *T. Story of the Alphabet* (c. 1900) also provides a readable account free from too much complicated scholarship.

Table II

HIS OCLY C EGYPT AN

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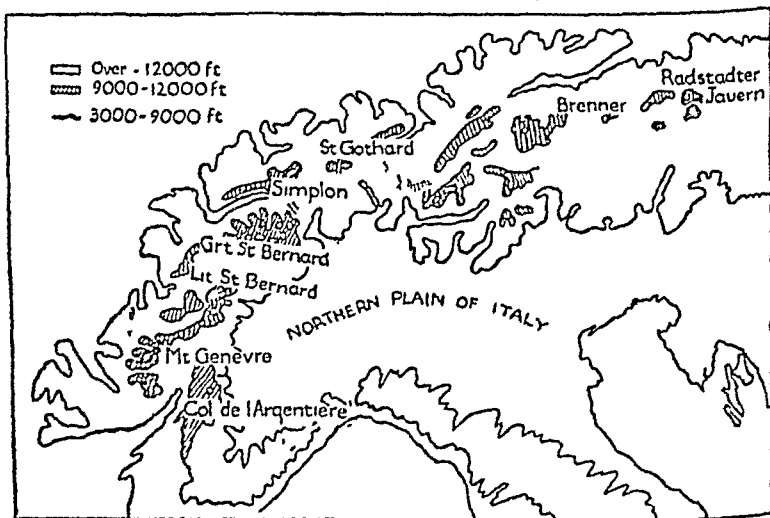
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to communication as have, e.g., the Himalayas

**Relief** The Alpine ranges run roughly in a broad half-moon from the Col d'Altare (the usually accepted division from the Apennines) N of Genoa, in a curve convex to W and N, to the neighbourhood of Lake Geneva, whence a series of parallel chains runs E. The more N and central of the E ranges run out towards the Danube in the direction of Vienna, the S ranges extend to the mountains of Friuli (N of Venice) and farther E

Tyrol, the Julian and the Styrian Alps. Highest summits include Mont Blanc (15,780 ft) in Savoy; Monte Rosa (15,200 ft), Matterhorn (14,780 ft) Dom (14,900 ft), Weisshorn (14,800 ft) in the Pennine Alps, Jungfrau (13,670 ft) and Finsteraarhorn (14,000 ft) in the Bernese Oberland

**Geology** The Alps are a section of a great fold in the earth's crust which reaches from the Atlas Mountains to S E Asia. The great central core is granitic, the flanking ranges are of varying composition, some of the



Alps Passes

into Yugoslavia. The whole range is c 700 m long and from 30 to 150 m in breadth, with a gradual slope to N and W, and an abrupt descent to S E.

**Principal Ranges** In the W the principal groups are the Maritime, Cottian, Graian, and Dauphiné Alps. The Mont Blanc massif, Pennine, and Lepontine Alps, with the Bernese Oberland, Titi, and Tödi chain, form the region of the great central peaks. The E chains, of lower elevation than those of the W. and centre, are more complex in arrangement, they include

great peaks, such as the Matterhorn are of crystalline slate, and there is a well-marked wall of limestones to N.

**Rivers** The Alps are the watershed of the Rhine, Rhone, Inn, and Po. Each of these great rivers is fed from innumerable confluent tributaries rising in the glaciers of the great central chain. The Inn being a principal tributary of the Danube, the Alpine snows are the source of drainage to the Black, Adriatic, Mediterranean, and North Seas.

**Passes** There are three groups of

passes leading from the N and W to Lombardy. The W passes the Mont Cenis Mont Genève Little and Great St Bernard converge on Turin. In the centre a double series leads through the parallel chains to Milan: the Gemmi Lötschen and Grimsel are passes to the Rhône Valley; the Simplon leads thence to Lombardy. The St Gotthard and Splügen farther E also lead to Milan. The third group connects the Inn valley with E Lombardy: the Brenner the lowest pass to Italy is the chief. Railways follow many of the great passes usually tunnelling through the higher parts of the route. Mont Cenis Simplon St Gotthard and Brenner are all so traversed the last by an overland line. The Lötschberg tunnel pierces the mountains between the Rander and Rhône valleys.

**Lakes.** The lakes are generally formed by the damming by morainic material of old glacier valleys. Lake Geneva (or Léman) is the largest in the N; others are Neuchâtel Zurich Lucerne Constance Brienz and Thun all chiefly or entirely in Swiss territory. S of the chain are Maggiore Como and Garda in Lombardy.

**Flora and Fauna.** Alpine flora varies with latitude and elevation. The lower Italian slopes have a Mediterranean flora. Olives vines and even lemons are cultivated. Conifers are typical of the middle region on both sides of the Alps and a fine deciduous forest (beeches etc.) clothes the lowest Swiss slopes. Above the forests is a pasture belt remarkable for its rich carpet of flowers in the early season and vivid green in mid summer. The Alpine rhododendron edelweiss gentian and primula are characteristic of the upper forest clearings and pastures. Near the snow line is an arctic flora. A little corn is grown in the pasture belt (above 7000 ft at Fiedelen) but barely sufficing for local needs. The vine grows on the lower terraces in Switzerland and especially in the Rhône valley. Cows are everywhere pastured but the grass is not so universally suitable for horses and

sheep. Herds of goats are a feature of the higher settlements. The indigenous wild animals are now almost extinct: chamois are still hunted but bears and wolves which were once numerous have ceased to exist save perhaps in the wilder regions of the E. Larger birds of prey including the lammergeier which may have inspired some of the dragon legends have died out. Golden eagles are still to be seen in fair numbers.

**Exploration.** The Alps were crossed by migratory tribes in the dawn of history and Hannibal's famous descent into Italy in the 3rd cent B.C. has been emulated by more than one military expedition since of which Napoleon's (1800) is the most renowned. In the Middle Ages the Brenner and Great St Bernard passes were in regular use. But systematic exploration of the peaks began only towards the close of the 18th century. Flacidus & Spöschel and H. B. de Saussure are the great names in the history of early Alpine exploration. Mont Blanc was conquered before the 18th cent. closed by Saussure and Balmat and before 1840 the Jungfrau Finsteraarhorn and a number of other smaller peaks had also been scaled usually by the native Swiss or Savoyards. English mountaineers began to be attracted to the Alps in the middle of the 19th century. Sir A. Wills made what he erroneously believed to be the first ascent of the Wetterhorn in 1834 and his account of the climb made important converts to Alpinism among his countrymen. In 1837-8 the English Alpine Club was formed and two of the most formidable of the remaining virgin peaks fell to Englishmen and their guides. Edward Whymper and his companions made their tragic conquest of the Matterhorn in 1865 and Sir Leslie Stephen overcame the difficulties of the Schreckhorn in 1861. By 1880 all the great summits had been scaled.

**Alpujarras** [ALPÚJARRAS] The district of mountain and glen between the Sierra Nevada and coastal

ranges in S Spain, remarkable for its rugged splendour, and for the variety of vegetation, which ranges from tropical to sub-arctic

**Alsace-Lorraine**, district and former province in E of France, between the Rhine and the Vosges Mountains, embracing the modern departments of Haut-Rhin, Bas-Rhin, and Moselle. Bounded by Switzerland on S and Germany on E and NE. Area, 5600 sq m

*Relief and Natural Resources* Lorraine is a low plateau to NW of Alsace, with a surface of wide undulating downlands. Alsace is a lowland between the Lorraine plateau and the Jura. Both are well watered by left-bank tributaries of the Rhine (Ill, Moselle, and Saar). Alsace is well wooded and fairly hilly, except in the region S of Belfort, which is low-lying and rather marshy, particularly near the Swiss border. The Vosges (qv) are a high forested sandstone range rising to over 3000 ft in mean elevation. Both districts are very fertile. Hops are grown in the Vosges, vines in the Moselle valley and elsewhere, cereals and tobacco are cultivated, and the whole area provides excellent orchards. The forests are a source of valuable timber. Minerals are very important. The Lorraine ores are probably the most extensive phosphoric iron deposits now being worked in the world. Salt, potash, coal, copper, and a little silver are also found.

*Population* Alsatians are usually German-speaking, but French in sympathy, the French-speaking element is stronger in Lorraine, but over 80 per cent of the total pop of Alsace-Lorraine speak German. Many of the inhabitants are small independent farmers. The iron industries of Lorraine and the textiles of Alsace have introduced a large industrial element. Chief towns: Strasbourg, capital of Alsace (181,500), Nancy, capital of Lorraine (120,600), Mulhouse (100,000), Metz (78,800). Metz and Belfort are important fortresses commanding "corridors" from the

Rhine into France. Pop. (1911), 1,898,400

*History* The twin provinces had a chequered history. Both were comprised in the old Middle Kingdom of Charlemagne's grandson Lothar, from whom Lorraine (Lothringen, German form) took its name. Situated in the debatable no-man's land between the growing nationalities of France and Germany, the province for long preserved a precarious independence nominally subordinate to the Holy Roman Empire. Lorraine was governed by a dynasty of dukes. Alsace became a congeries of fiefs, tenures and privileged cities. In the Middle Ages the Habsburgs had important interests in Alsace, but they did not weld the province into the empire. Alsace was largely absorbed by France at the Treaty of Westphalia in 1648. This settlement made apparent the total disintegration of national unity in Germany, and France (which had dominated the peace conference) steadily won Alsace to partnership in her civilisation. The absorption was completed 1681-4. Louis XIV, and confirmed at the Peace of Ryswick, 1697. The reversion of the Duchy of Lorraine passed to France in 1766. Neither acquisition according to modern political standards was, perhaps, defensible, but France governed her new provinces wisely and generously, the people became French in sympathy and culture, and were spared the narrow particularism which overtook German provinces as a whole in the 18th century. The recovery of Alsace-Lorraine by Germany in 1871 was unpopular, and after the World War the provinces were returned to France.

*Alsatia*, in the Stuart period, part of London between the Thames and Fleet Street, jurisdiction over which was not clearly defined (hence no name = Alsace), a resort of criminals and social outcasts. Immunities were abolished 1697. For description, see Scott's *Fortunes of Nigel*.

*Alsatian*, a remarkably wolf-like d

## Alsen

163

## Alum

used on the Continent as a sheep-dog and until recently known to English fanciers as the Belgian sheep-dog. Three varieties are admitted the long-coated wire haired and smooth coated the last being the type popular in this country.

**Alsen.** Island in Baltic Sea off Schleswig coast (Little Belt). Taken from Denmark by Prussia 1864 but returned in 1900. Fruit and grain capital Sonderburg. Area over 100 sq. m. pop. c. 25,000.

**Alpine** chickweed like plants among which is *Alpine Isotria* a dwarf rock plant with white flowers.

**Altai Mountains**, chain in Central Asia running in two main ranges W & W from Gobi Desert across Outer Mongolia and into Siberia. Average height over 5,000 ft. In approximately the same latitude as Switzerland the scenery resembles that of the Alps but the snow-line is much lower (7,000-8,000 ft). Source of R. Ob and Irtysh. Great mineral wealth in Siberian region. Highest mountain Byelukha (14,900 ft).

**Altair** see CONSTELLATIONS

**Altar** appurtenance of religious worship in widespread use either for prayer or sacrifice. At the Reformation the term Lord's Table was preferred as the word altar carried with it the association of the sacrifice of the Mass. In most churches the High Altar is at the E. end but in many there are other altars in side chapels etc.

**Altamuth**, see OBSERVATORIES

**Altötting**, capital of Canton Uri Switzerland associated with the legends of William Tell. Pop. c. 4,100.

**Alternating Current**, see ELECTRIC MOTORS

**Alternative Vote** see FRANCHISE

**Althea** (*Hollyhocks*). There are several species but these have been intimately mixed by the hybridist and there are now various strains possessing single and double forms and almost every shade of colour excepting blue. Although perennial they are best treated as annual and

seeds sown in January and February produce plants that bloom in the autumn otherwise sown in July they bloom the following season. *Hibiscus syriacus* and Marshmallow (*q.v.*) belong also to this group.

**Althorn**, a musical instrument of the Sax horn family the alto Sax horn or tenor horn in E flat.

**Altimeter** see BAROMETER

**Altmühl**, tributary of the Danube on left bank of upper stream. Rises on tableland of Franconia and joins Danube near Regensburg (Ratisbon) Bavaria. Connected by canal with the Rhine. Length over 100 m.

**Altona**, town on right bank of the Elbe in Holstein Prussia adjoining Hamburg with which it is closely connected commercially though historically and governmentally distinct. Docks and repair yards. Trade in tobacco and textiles soap and glass manufactures. Pop. (1901) 74,000.

**Altoona**, city of Pennsylvania U.S.A. in Blair County. Important railway centre in neighbourhood of Pennsylvania coalfield c. 100 m. E. of Pittsburgh railway works. Pop. 8,000.

**Altrincham** [AWL TRING-ŌM] town in Cheshire not far from Lancaster border S.W. of Manchester. Market town and residential district for Manchester business community. Local industries are expanding especially engineering sawmills market gardening. Pop. c. 21,000.

**Altyn Tagh**, N.E. branch of Kuen Lun Mountains (*q.v.*) in Central Asia separating Tibet from Sin Kiang and E. Turkestan.

**Alum**, a generic name referring to the double sulphates formed by aluminium with various metals. The name is usually applied to potash alum the double sulphate of aluminium and potassium. The term alum is also used to indicate aluminium sulphate and double sulphates generally which may contain no aluminium whatever thus having been replaced by another metal such as chromium or iron that is also trivalent. See also ALUMINIUM.

Alumina, the oxide of aluminium, having the formula  $Al_2O_3$ . See also ALUMINIUM

**Aluminium** [AL-Ū-MIN'-YŪM], although discovered only comparatively recently, is the most widely distributed metal in the earth's crust, and is the third most common element (see ELEMENTS). The name is derived from the Latin *alumen*, which was applied to substances with an astringent taste, in this particular instance impure aluminium sulphate, which is found naturally. Modern *alum* (*qv*) is a different compound.

Metallic aluminium was first isolated in 1827, but manufacture on anything like a large scale was not begun till much later, and the modern aluminium industry dates from the closing years of the last century. The world production of aluminium is over 200,000 tons per annum.

Aluminium is an extremely difficult metal to separate from its ores. The only practicable method for industrial purposes is that which, with minor modifications, is in use the world over to-day. This consists in the electrolysis of alumina, dissolved in fused cryolite, a double fluoride of sodium.

The electrolysis is carried out by extremely heavy currents (of the order of 10,000 amperes) at low voltages (*c* 6). The electrodes are of carbon, of which about half a ton is used per ton of aluminium produced. The carbon combines with the oxygen in the alumina, and the carbon oxides are removed in the gaseous state. The temperature of the process is about 900° C, which is far above the melting-point of aluminium, which is run off from the bottom of the bath. No cryolite, except that unavoidably wasted, is consumed in the process, the rôle of this compound being merely that of a solvent.

Aluminium has a multitude of uses. In engineering it is of value for the manufacture of vehicle and engine parts on account of its great lightness. In the manufacture of engines another favourable feature is its excellent

thermal conductivity, by which excessive heat is rapidly dissipated. In the aircraft industry aluminium is invaluable on account of its lightness, both when used by itself and when alloyed with other light metals such as magnesium and beryllium in the production of light alloys such as *duralumin*.

In the electrical trades aluminium is widely used, as it is an excellent conductor, being second only to copper and silver in this respect. In the stretching of transmission lines the saving in weight gained by the use of aluminium as compared with copper more than compensates for the slightly larger wires necessary owing to the lesser conductivity of aluminium.

Aluminium paint is increasing rapidly in popularity owing to its great covering power, highly reflecting surface, and small weight, the second point is of importance, since surfaces painted with aluminium remain, when exposed to sunlight, at a temperature several degrees below that of their surroundings. This is of value when the object painted is, for instance, a petroleum storage tank, where a rise in temperature greatly increases the evaporative loss.

Aluminium is also largely used in the food industry for the manufacture of vessels, both for industrial and domestic purposes. Long investigations have shown that the minute amounts of aluminium which may be dissolved by the food juices are entirely innocuous.

Owing to its comparative inertness aluminium is also employed to a considerable extent for the manufacture of plant for use in the chemical industry.

The metal is unaffected by nitric acid and by dilute sulphuric acid. It is, however, very rapidly attacked by alkalis, in which it dissolves with the formation of aluminates.

Aluminium has a great affinity for oxygen, and it is therefore sometimes added in minute amounts to steel in order to de-oxidise the latter during

**Aluminium**

**Amadeus**

refining This affinity of aluminium for oxygen is also made use of in the Goldschmidt (also known as Thermit) process by which on mixing aluminium powder and a metallic oxide and igniting the oxide is reduced with the formation of the metal which owing to the great heat generated is in the molten state and can be readily run off from the bottom of the crucible. An explosive *ammonal* used during the World War in Mills bombs is manufactured from a mixture of ammonium nitrate and powdered aluminium.

**Aluminium Compounds** Perhaps the most important aluminium compound from the industrial point of view is the sulphate  $Al_2(SO_4)_3$  which is used in the manufacture of the various double sulphates of aluminium with alkali elements known as *alums*. These latter find important uses in the textile industry principally as mordants for dyes. In medicine they find application as astringents as do the majority of aluminium salts. *Alumina* or *alumina* which is prepared by the purification of naturally occurring hydrated aluminium oxides is used in the manufacture of refractories as for instance *emery* used as an abrasive is an impure aluminium oxide. *Aluminium hydroxide* which is obtained by precipitation on the addition of an alkali to a solution of an aluminium salt is used for clarification of various liquids such as sewage and also for the same purposes as the alums. *Aluminium chloride* in the anhydrous form is an extremely valuable compound in the organic chemical industry where it is used as a polymerising agent.

Various aluminium oxides and silicates are of importance in the pottery and ceramic industries of which they form to a large extent the raw materials.

**Aluminium Bronze, see ALLOYS**

**Alundum**, a basic refractory substance made by fusing natural aluminium oxide (*bauxite*) in an electric furnace removing the impurities by

settling and crushing the remainder with clay and felspar. The product is finally fired in a porcelain kiln at 1500 C.

**Alun Root, see HEUCHERA**

**Alva, Ferdinand Alvarez de Toledo Duke of (1508-1553)** one of the greatest and most ruthless of Spanish soldiers first held a commission under Charles V. was a general at the age of 18 and fought at the battle of Tunis in 1535. He led an invasion of France in 1555 and under Philip II ravaged Italy until peace was made at Rome. Alva was appointed Governor of the Netherlands and stamped out the Protestant movement from 1567 to 1573 when he was recalled at his own request. In 1581 he swept across Portugal and plundered Lisbon dying at Thomar two years later.

**Alverstone, Richard Everard Webster** first baron (1841-1915) Lord Chief Justice of England. He was British representative on various international arbitrations and was an arbitrator in the 1903 Alaska boundary dispute.

**Alwar (1)** Native State Rajputana India. Hills in W and level in E. not well watered. The ruler of the State was ordered by the Indian Government in 1933 to absent himself for two years while it was reorganised. Area 340 sq. m. pop. preponderantly Hindu (101) 61,000. Town capital of (1) above situated 90 m. from Delhi; city wall, palaces and temples. Pop. 41,800.

**Alyssum (Madwort)** well known rock plants. The annual kind is *Alyssum maritimum* (Sweet Alyssum) in white, lavender and light yellow. The perennials include several species with yellow flowers a few white and some with silvery foliage. Very hardy and requiring ordinary culture.

**Amadeus VIII (1391-1451)** Count of Savoy became the 1st Duke of Savoy in 1416. He extended the territories of Savoy and introduced many reforms. He reigned 1434 leaving his son to rule. In 1439 the Council of Basel elected



4), and Hamilton Rice (1924) have done much to clear up the topography of the Amazon basin. In 1925 an expedition, led by Colonel Fawcett, an English explorer, attempted to penetrate the Matto Grosso drainage area from the S, but it was not heard of again, and it was surmised that its members had been murdered by natives.

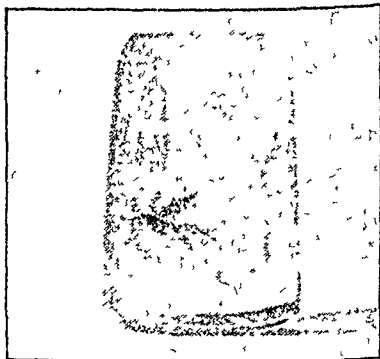
**Amazonas.** (1) The largest Brazilian State, is practically coincident with the Brazilian basin of the R Amazon (qv). Area, 731,400 sq m, capital Manaus, pop (est 1929) 433,800. (2) S Venezuelan territory adjoining Brazilian Amazonas, watered by the upper Rio Negro and the upper Orinoco. It includes the Cassiquiare "canal", is forested and well watered. Pop (1926) 60,000. (3) Department of N Peru on E slope of Cordilleras, watered by the R Marañon. The climate is warm and unhealthy. Crops are coffee, cotton, coca, sugar, and cacao. Area, 14,000 sq m. Pop (est 1927) 80,000.

**Amazons**, according to Greek mythology, a race of warlike women living on the S coast of the Black Sea. The battle between the Greeks under Theseus and the Amazons is a favourite subject of Greek frieze-sculptures.

**Ambassador**, the highest diplomatic envoy of a State, regarded as the personal representative of its head. Only the more important States, empires, kingdoms, and republics send or receive ambassadors. See LEGATION.

**Amber**, petrified gum from coniferous trees. A light, pale-yellow or brownish translucent substance usually found washed up on certain coasts, such as the Baltic, Adriatic, and Chinese, in rounded lumps up to 10 lb in weight. It is typically associated with lignite beds of Middle Tertiary Age. It was used for ornaments as far back as the Stone Age, and has been found among prehistoric remains in Switzerland, Egypt, and Assyria. It is recorded by Homer, the Greek name being *elektron*, from which our word electricity is derived, since amber

becomes electrified when rubbed. Insects and other forms are often enclosed in amber in splendid preservation.



Amber, embalming fly

tion, having been entangled in the gum and fossilised with it.

**Amberboa** (*Fairy Sweet Sultans*), hardy annual plants with lavender and rose flowers of a thistle-like character.

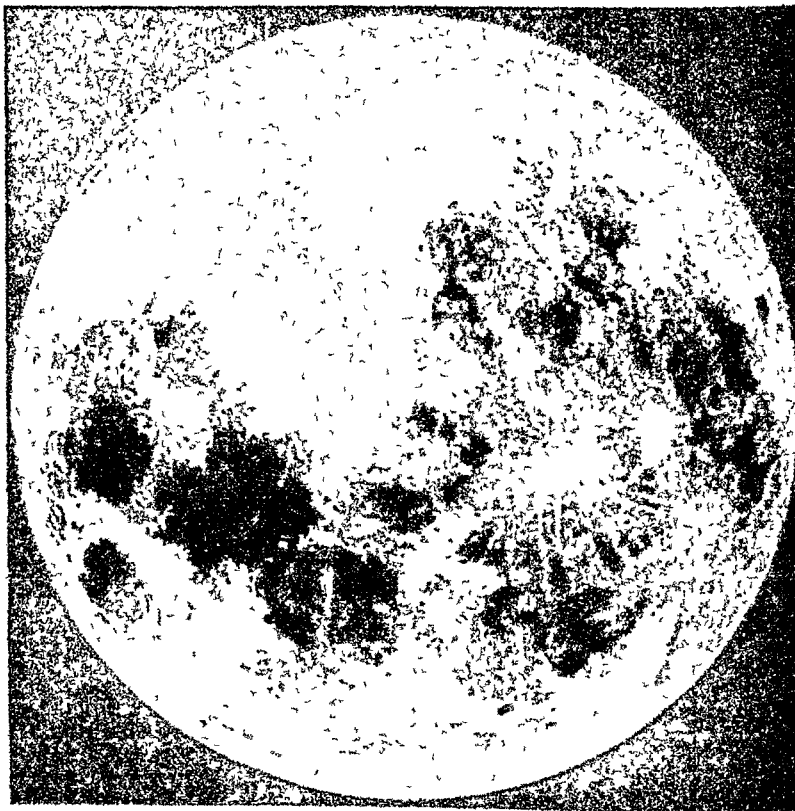
**Ambergris** [AM'-BŪ-GRES], a pathological secretion sometimes found in the stomach of the sperm whale, in lumps up to 100 lb in weight, it is also occasionally to be met with floating on the sea, having presumably been vomited by the animal. It is a wax-like material of a greyish colour, and possesses a disagreeable odour. Chemically it consists of higher alcohols, together with some fatty acids. It melts at about 60° C, and at 100° volatilises to a white vapour.

It is soluble in hot alcohol, and when purified is used in perfumery as a fixative and to give fragrance to scents. It is thought that the odorous material of ambergris originates in a species of cuttle-fish upon which the sperm whale feeds.

**Ambo**, a desk in the early Christian Church used as a pulpit, and also for the purpose of reading notices.

**Amboina**, island and town of Moluccas group in the E Indies. The island is volcanic and disturbed by earthquakes. Products are timber





ASTRONOMY THE FULL MOON  
Photographed by the Yerkes Observatory, U.S.A.

## Ambrose

and spices especially cloves The town is the seat of a Dutch Residency of the same name which with the Ternate Residency forms the Government of the Moluccas A massacre of British settlers on the island in 1623 did much to inflame the animosity which found expression in the Dutch wars of the Commonwealth and Restoration (See Dryden's tragedy *Ambosyna*) Area 76 600 sq m pop of island 400 000

Ambrose St (c 340-397) was made Bishop of Milan in 374 while still unbaptised giving his land to the Church and his money to the poor He preached against Arianism and opposed the pagan reaction He was a successful diplomat on Italy's behalf at first dissuading Maximus from attacking the country Later when Maximus took Milan Ambrose worked among the people until Theodosius Emperor of the East regarded the

169

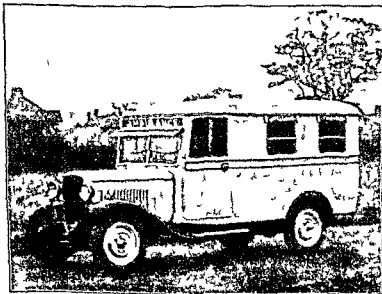
kingdom He wrote many hymns some of which are still in use but not as was once thought the *Te Deum* and systematised ecclesiastical music introducing antiphonal singing into the Church of Milan

Ambrosia (pr n AMBRŌZIA) the name given in Greek mythology to the food and sometimes the drink of the gods the term *secular* being exclusively applied to their drink Ambrosia has given its name to certain herbs and hence the term ambrosial has come to mean fragrant

Ambrosian Chant, an early form of plain song (qv) now superseded by the later Gregorian chant except in the diocese of Milan where it is still in use

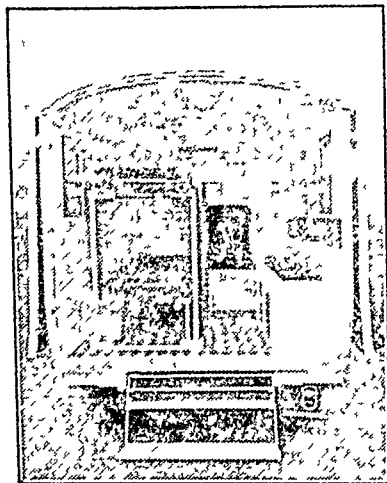
Ambulance a vehicle for carrying the sick or injured to hospital or one in which they can be treated Ambulance wagons in the field were introduced by the French only at the end of the 18th cent The lack of

2nd edn



Type of Ambulance (Bed,ord) serving street accidents.

ambulance facilities in the Crimean War caused great hardship, and exposure of these horrors by Dunant, a Swiss, was the first step towards the formation of the Red Cross in 1863. In the British Army ambulance wagons, which contain 4 stretchers and room for 6 men seated, work in connection with a corps of stretcher-bearers, who collect the wounded from the front and bring them to the ambulance, having first treated them



Interior of Ambulance used to attend street accidents

with field dressings. The wounded are then driven to the dressing-station, where, if necessary, a second-line wagon carries them to the field hospital.

Important ambulance work, both in war and peace, is also done by voluntary societies (see RED CROSS, ST JOHN AMBULANCE CORPS).

**Ambuscade** (or *Ambush*), the concealment of troops, originally in a wood (Italian *imboscata*, from *in* and *bosco* = a wood), for the purpose of making a surprise attack. Ambush is chiefly practised in primitive and guerrilla warfare.

**Amen**, a word used in the Christian religion at the close of prayers and sometimes of hymns, and in the Jewish synagogues after the final blessing. It is a Hebrew word meaning "truly," or "yes."

**Amendment**, an alteration or correction, thus, a Bill before Parliament or a motion before any committee may be altered before it is passed in its final form by moving and carrying amendments. In law, the correction of errors in a writ or in the pleadings in an action or suit.

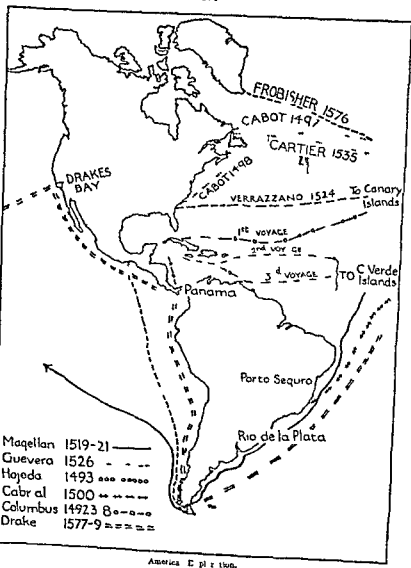
**Amenhotep**, the name of four kings of Egypt from the 16th to 14th centuries B.C. Amenhotep I conquered the Libyans. Amenhotep II and Amenhotep III improved conditions in their own kingdoms and patronised the arts. Amenhotep IV enjoyed a peaceful reign after early disturbances.

**Amenthes**, the name given, in Egyptian mythology, to the underworld, where the spirits of the dead were judged by Osiris.

**Amercement**, in early English law, a sum of money paid to avoid a forfeiture of property.

**America**, the general name given to the two continents of the New World. The land mass consists of two roughly triangular continents, connected by the Isthmus of Panama, and occupying the W hemisphere from the Arctic Sea to Cape Horn in lat  $50^{\circ}$  S, the greatest extent of land from N to S on the globe's surface.

**Physiography** The continents are treated fully under N and S America (qqv). Certain characteristics point to a common origin for both the continents. Both have a backbone of lofty mountains (Rockies, Central American Cordillera, and Andes) elevated in geologically recent times on the W, in both, the Atlantic shore is fenced by an ancient, much denuded fold (Appalachian chain, Brazilian highlands), both have extensive central plains (prairies, pampas), and in the N a plateau watershed of very ancient rock (Laurentian plateau, Guiana). The differences in the features



ures of the relief are important (neither the Great Lakes nor the Mississippi-Missouri drainage in N America have any parallel in the S). But the geological evidence, and the markedly greater breadth of N America, support the theory that the American continents form the exposed surface of a huge ancient triangular mass of land.

**Climate** The Americas vary greatly in climate, by far the greater part of N America lies in the frigid and temperate zones, whereas Central and S America include a large area in the tropics. The characteristic flora and fauna thus present wide differences, and the process of colonisation has also been influenced. N Europeans have proved the most successful colonists in N America, and the Iberian peoples in the South.

**Early Civilisations** The ancient inhabitants of the American continents consisted of the backward Eskimo of the extreme N, and the so-called Indians (see RED INDIANS). Recent discoveries have brought to light the ruins of an ancient Maya (qv) civilisation in what is now the jungle of Central America, and the conquistadores met and destroyed two highly developed cultures in Mexico (see AZTECS) and Peru (see INCAS).

**Colonisation and Exploration** (see N and S AMERICA and EXPLORATION). The name America is derived from Amerigo Vespucci, one of the explorers who came after Columbus, though doubt has been thrown upon his claim to rank as an explorer at all. The name America was first used in the *Cosmographie Introductio* of the geographer Waldseemüller, published in 1507. Although the Spaniards made many explorations in the N continent, and especially on its W coast, the great work of the Iberian races was done in the centre and S, and the penetration and settlement of N America was chiefly the work of French and British colonists.

The main lines of progress diverged early in the 17th cent, and may conveniently be treated apart. Of the

early voyages of the Norsemen, little is known beyond the fact, preserved in the Icelandic sagas, that either Leif Ericsson, or another hardy navigator of the same race, reached the American mainland (probably Labrador) from a colony in Greenland, somewhere about the beginning of the 11th cent.

The languages of the aboriginal Americans defy classification; there is an immense number of dialects which it is difficult to relate to any parent stock. Some of the languages, especially in Central America, have a well-developed syntax and inflectional system. There is a tendency in the languages to compress syntactical constructions into single polysyllabic words.

**America Cup**, see YACHTING

**American Blight**, an insect which attacks apple trees, and is a very costly pest. Its presence is shown by the appearance of white cottony matter in the cracks and excrescences of apple-tree branches in the spring. When crushed the insects exude a reddish fluid. They pierce the sap-vessels of the tree, suck the juice, and cause wounds which ulcerate, and finally destroy the attacked branch by corroding all the sap-vessels. The cottony matter is abundant, and, wafted to other trees, conveys infection to them by bearing with it the eggs or embryo insects. Most of the females are wingless, except in seasons propitious to colonisation. The males are uniformly winged. In the winter these insects retire underground, and prey upon the roots of the apple tree. A tree thus ravaged at all seasons will soon be killed unless prompt and vigorous remedies are adopted. The affected roots may be bared and left exposed for a few days to the cold, and the earth, before being returned, saturated with ammoniacal liquor from the gas-works. In early March the branches should be scraped and scrubbed with the same ammoniacal liquor, or a strong brine of common salt. Spirit of turpentine applied with a brush to every affected patch is

American

American

effective and paraffin emulsion also is valuable

**American Civil War** The fought between the N and S States of America was one of the most important wars in modern history for by the defeat of the S the preservation of the Union was assured. The cleavage between the N and S was very sharp. The social and economic structures differed radically. The S was a cotton-exporting country based on large estates worked by slave labour. The N a growing manufacturing country with an agriculture of small farmers. The S States supported slavery and Free Trade the N opposed slavery and supported Protection. In party politics the same divergence was to be seen. The Democratic Party whose main plank was the principle of State sovereignty drew most of its support from the S while the Republican Party more concerned with strengthening the Federal powers than with the rights of States had its centre in the N. Fundamentally the struggle was between the two groups for the hegemony of the U.S.A. Their ideas as to the nature of the Union quite apart from its policy differed so sharply that a conflict was inevitable. The W was the key to the situation whichever party won the W would gain mastery of the Union. So the S tried to extend its system of slavery W the N to prevent this. The election of Lincoln an anti-slavery candidate as President of the U.S.A. in 1860 showed the S States that they were losing. Eleven States seceded from the Union in 1861 and formed a confederacy.

The preliminary hostilities were unimportant but with the bombardment of Fort Sumter in April 1861 by the S the war began in earnest. Until 1863 there were three separate campaigns one in the E in Virginia with the capitals Washington and Richmond as the objective of the Confederate and Federal armies respectively. The second in the valley of the Ohio. The third in the W beyond

armies suffered a series of defeats at Bull Run (1861) and Fredericksburg (1862). But the whole power of the N was thrown into the conflict and the S was gradually weakened by the successful blockading tactics of the Federal Fleet. In 1863 the tide turned—the Federal General Meade defeated the Confederate Army under Lee at Gettysburg. In the other fields a Federal Army was successful in the Shenandoah valley and Sherman with the army of the Ohio marched through Tennessee and Georgia to the sea where he established communication with the N. The Confederate forces were driven back from all sides and in April 1865 Lee surrendered to Grant and the S States submitted to the N. See also UNITED STATES OF AMERICA.

**American Independence, War of**, between Great Britain and the revolt of American Colonies was caused by quarrels over commercial affairs (see STAMP ACT). The immediate occasion of the war was an attempt made by the British troops at Boston to capture some stores at Concord (battle of Lexington April 19 1775). The whole country turned out to cut off their retreat and they reached Boston with difficulty. The Americans captured the forts of Ticonderoga and Crown Point and repulsed the British at Bunker Hill (June 17 1775). George Washington the American commander worked under great difficulties. The American Congress gave him little support his soldiers were largely inefficient and his officers corrupt. His generalship over the small forces on which he could rely together with the guerrilla tactics of the farmers decided the war in favour of the Colonists.

After having forced the British to evacuate Boston Washington suffered a series of reverses in 1776 at Long Island White Plains and Fort Mifflin. During the winter the Americans won battles at Trenton (Dec 26 1776) Princeton (Jan 3 1777). General Burgoyne surrendered to the Americans



cans at the battle of Saratoga (Oct 17). The following years were not marked by any decisive battles. The British captured Philadelphia and occupied New York after the drawn battle of Monmouth in 1778. In the S the British were less successful. An attack on Charleston failed and in 1781 the combined forces of Washington and the French volunteer, La Fayette, drove the British into Yorktown, Virginia. The French aid in 1781 brought fresh troops and ships to aid the Colonists, and in October the British force in Yorktown surrendered. In New York the British held out for nearly two years, and the main seat of warfare shifted to the West Indies, where the British were attacked by the French. Peace was signed at Paris 1783 and the Independence of the Colonies acknowledged. See also BOSTON TEA PARTY, VERSAILLES, PEACE OF

**American Indians**, see RED INDIANS

**Americanism**, a term applied to any linguistic divergence from the parent speech of England manifested in the language of the U.S.A. Such divergences may be due to borrowing from native Indian words or from other sources, to sheer innovation, or to the survival of archaisms that have dropped out of English. Many of the commonest words are different in American and English (e.g. lift—elevator, caretaker—janitor, treacle—molasses). One tendency of spoken American is the elimination of many of the surviving inflections and grammatical forms of English.

**American Literature** Necessarily starting as a mere offshoot and reflection of contemporary English literature, the literature of America gradually acquired an individuality of its own, until to-day it is as definitely a separate literature as that of any modern culture. The earliest productions of the 17th cent were a number of historical and geographical accounts of the settling and conditions of New England and Virginia, and a considerable body of theological works.

Perhaps the most memorable of the latter are *The Simple Cobbler* of Nathaniel Ward (1647), and in the next century Cotton Mather's *The Ecclesiastical History of New England* (1702). Samuel Sewall's *Diary* (1674-1720) is the most interesting New England book of this period. In the 18th cent Philadelphia became a literary centre, with Benjamin Franklin as its most prominent figure. His literary fame rests on *Poor Richard's Almanack* (1733-58), the *Autobiography* (1771-89), and his *Letters*.

The political circumstances of the second half of the 18th cent were not such as to encourage the growth of literature, and such writings as were produced were almost entirely political. They are best represented in the *Letters of Thomas Jefferson* (1743-1820). But in Connecticut there arose the first group of American poets, none of whom, however, was the equal of Philip Freneau (1752-1832) of Princeton. Two books of this century merit a special reference: the *Letters from an American Farmer* of Crèvecoeur (1735-1813) and William Bartram's book of travels (1739-1823).

In the 19th cent America experienced to the full the effects of the Romantic Revival in literature; and the national outlook during this period was further influenced by the wars with England and Spain, and the slavery disputes culminating in the Civil War. Foremost in time among its writers was Washington Irving (1783-1859), the founder of the "Knickerbocker" group of New Yorkers and a world pioneer in the art of the short story (q.v.). To New York belonged also America's first considerable poet, William Cullen Bryant (1794-1878), the satirist and realist Herman Melville (q.v.), and one of the greatest poetic individualists of all time, Walt Whitman (q.v.). In the S the supreme genius of letters was Edgar Allan Poe (q.v.). In Massachusetts the demand for the abolition of slavery found expression in the work

# American

175

Amer

of J G Whittier (qv) and Harriet Beecher Stowe (qt) From New England came also the philosophic and reflective writings of Emerson (qv) and Henry David Thoreau (qv) and such other world famous writers as Longfellow James Russell Lowell Oliver Wendell Holmes and Nathaniel Hawthorne (qv v)

A little group of poets who produced charming work completely detached from the realities of life includes Bayard Taylor (1825-1878) Thomas Bailey Aldrich (1836-1907) and Sidney Lanier (1842-81)

In the latter half of the 19th cent a note of realism becomes increasingly apparent in American literature and this tendency manifested itself in a growing attention to local colour and the development of the short story To this period belong Bret Harte and Mark Twain and James Whitcomb Riley (qv t) Among novelists Marion Crawford (qv) had the widest appeal but he was more a romantic and less in tune with the spirit of his age than Henry James (qv) A final reference is due in the history of 19th cent literature to the poetry of Richard Henry (1864-1900) who followed the European traditions and to the stories of Miss Alcott (qv)

The 20th cent began and still continues as an age of transition in American literature too recent to admit of its being viewed in correct perspective Most of the work of Jack London (qv) belongs to its early years A new intellectual pre-occupation with social problems is evidenced for instance in the novels of Frank Norris and Upton Sinclair (qv v) Poetry found variously new expression in the work of Ezra Pound Edgar Lee Masters Amy Lowell and Vachel Lindsay (qv v) But the short story becomes more and more the preponderating literary medium and the host of American short-story writers more or less directly new O Henry as their model

A notable work which appeared before America's entry into the World

War was James Huneker's *Ivory Apes and Peacocks* (1915) The War itself produced little of value in literature but it led to a great revival of the national spirit which is mirrored in the novels of Sinclair Lewis Theodore Dreiser and others The modern tendencies of literary criticism in America are characteristically expressed in the work of H L Menckner (qv) and a notable dramatist has appeared in Eugene O'Neill New experiments in writing were welcomed as in the case of Christopher Morley's *Thunder on the Left* and the books of James Branch Cabell But apart from such more or less fantastic *de force* the general trend of the best American literature continues to be towards realism and its pictures of life show a tendency to become increasingly cinematographic as in the work of John dos Passos *Manhattan Transfer* etc

**American Organ**, a free reed instrument of the harmonium type but differing from the latter in that the air is sucked in instead of being pumped out

**American Spanish Treaty** at the close of the war in 1898 provided for cession by Spain of Cuba and her other West Indian possessions and payment by America of \$ 20000000 for the Philippines and Sulu Islands

**American War** (1812-15) War between England and America over the action of England towards neutrals in the Napoleonic wars The English took Washington but lost heavily at New Orleans and peace was signed at Ghent Dec 24 1815 It was during this war that the action between the *Chesapeake* and *Shannon* took place

**Amerinds**, see **PRE INDIANS**

**Amerly** Leopold Charles Maurice Stennett (b 1833) British politician M P since 1911 was Assistant Secretary of the War Cabinet in 1917 on the Versailles War Council staff (1917-18) First Lord of the Admiralty 1919-21 Chairman of two Imperial Conferences as Dominions Secretary

of State under the Conservative Government (1925-9)

**Amethyst**, quartz (*qv*), coloured violet by the presence of manganese as an impurity, but, if the colour is not deep, small pieces, after cutting, will be nearly colourless. Widely used as a semi-precious stone in jewellery, it is found in Russia, India, the United States, and Brazil. In the 15th cent. the amethyst was credited with the virtue of making the wearer sober-minded. Some gums sold as carnegorms are really yellow amethysts. Oriental amethyst may be the ordinary kind, but is typically purple corundum (*qv*).

**Amharic**, a Semitic language (*qv*) and the prevalent speech of Abyssinia. It has been largely influenced by the Hamitic languages (*qv*).

**Amherst, Jeffrey, Baron** (1717-1797), British field-marshal and associate of William Pitt. Amherst had a brilliant army career, and with Wolfe in Canada gained successes at Fort du Quesne and Montreal. He was for some time Governor of British N. America.

**Amice**, a vestment worn in the Roman Catholic Church and by certain sections of the Church of England. Originally a head-dress, it is now a piece of linen worn round the shoulders under the alb, at the celebration of the Mass and other services. It went out of use in the English Church at the Reformation, but has recently been restored by the High Church party.

**Amicus Curæ** [*A-mī'-kūs kŭ'-rī-ē*] (Lat., "A. friend of the court"), denotes a person, generally a barrister, who, not being himself engaged in the case, assists the Court with information as to a special matter of fact or law.

**Amides**, a group of nitrogen-containing organic compounds which are derivatives of ammonia, one or more of the hydrogen atoms being replaced by an organic radical. Most amides belong to the class of primary or acid amides in which the hydroxyl (OH) group of an acid is replaced by an amido (NH<sub>2</sub>) group. The amides,

with the exception of the lowest member of the group, formamide, are solids, the lower members are soluble in water.

The principal amides are dealt with under their own headings.

**Amiens**, city of N. France, on the R. Somme, capital of the Somme department in Picardy, is an important railway centre on the Calais-Boulogne-Paris line. Textiles (linen, velvet) are made. The town is of Roman foundation, with a fine Gothic cathedral (13th cent.), and a 16th cent. hôtel de ville. The Treaty of Amiens in 1802 closed the first phase of the Napoleonic wars. In the World War Amiens was of considerable importance on British lines of communication. Pop., 90,200.

**Amiens, Battle of** (Aug. 8-21, 1918), a surprise attack on the German 2nd and 18th Armies, by the British 4th Army (with the Australian and Canadian Corps), and the French 1st and 3rd Armies. The Germans were driven back and a wide breach made in their line. This battle was the turning-point of the war, and Ludendorff called Aug. 8, 1918, "the black day of the German army," since it made clear that a German victory was thenceforth out of the question.

**Amines**, a group of nitrogen-containing organic compounds which may be considered as derivatives of ammonia, NH<sub>3</sub>, in which one or more of the hydrogen atoms are replaced by alkyl (aliphatic) or aryl (aromatic) radicals. The replacement of one, two, or three hydrogen atoms gives rise to primary, secondary, and tertiary amines respectively. The lower aliphatic amines are gaseous, with increase in molecular weight they become liquids, and finally solids. The amines are all strongly basic bodies, many having an ammoniacal odour. They give salts with acids and, like the alkaloids, they yield double platinum chlorides. Many of the lower aliphatic amines are found in nature, chiefly in the decomposition products of proteins.

The amines can be prepared in

various ways one of the best is by the interaction of the corresponding alkyl halide with ammonia. The aromatic amines are best prepared by the reduction of the corresponding nitro-compounds, the best known aromatic amine is *aniline* (q.v.).

The principal amines are dealt with under their own headings.

**Amino-Acids** a group of organic compounds of great biological importance. They may be considered as derivatives of the fatty acids (q.v.) in which a hydrogen atom in the radical has been replaced by the amino ( $\text{NH}_2$ ) group.

Amino-acids are found in large amounts in nature being obtained by the breaking-down (hydrolysis) of proteins. Investigations in this direction have shown that the proteins (q.v.) are ultimately built up of long chains of amino-acids.

Many of the amino acids e.g. tryptophane (q.v.) are essential for animal nutrition since they cannot be synthesised by the animal body but obtained only by the breakdown of vegetable proteins (see DIET BIOCHEMISTRY).

**Amir** Ameer or Emir (أمير or إмир) a common Mohammedan title roughly equivalent to the English 'lord'. It is borne by the descendants of the prophet and by the holders of certain offices and it is the etymological origin of the English word Admiral.

**Amirante** (= Admiral) Islands, group in Seychelles Islands (q.v.) Indian Ocean. They are a coral format on.

**Ammeter** [AMĒTŌ] see ELECTRIC MEASURING INSTRUMENTS.

**Ammanus Marcellinus** (c. 330-400) the last Latin historian of the Roman Empire. His history of the empire from 98-378 was written in 31 books of which only the last 18 now remain.

**Ammines** (not to be confused with amines q.v.) are complex compounds formed between certain metals and metallic compounds and ammonia. Typical metals forming this type of compound are cobalt and platinum.

Whilst of considerable theoretical interest especially from the point of view of the various theories of valency these compounds have no commercial uses.

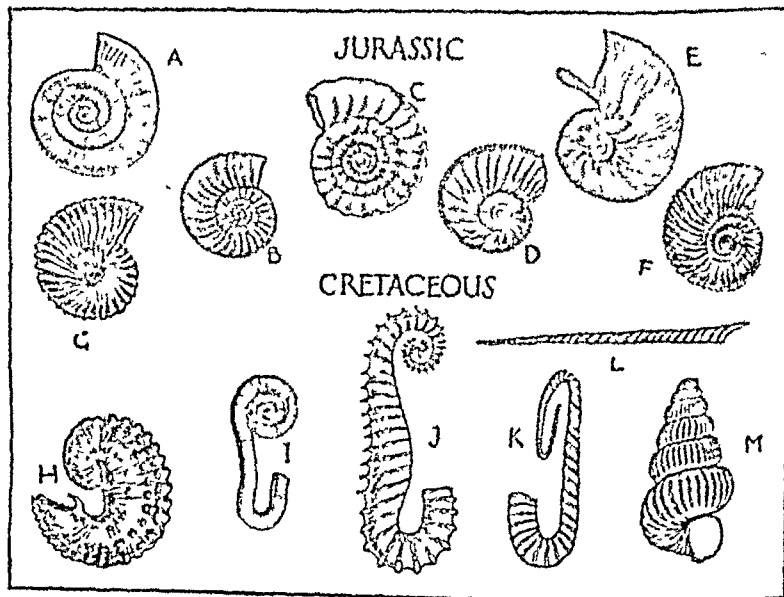
**Ammon** (Amen, Amon) a god of Ancient Egypt. The worship of this god universal in Egypt as always associated with some other generally with Ra. Later as Amen Ra he was worshipped as the Supreme God and by the Greeks thought to be identical with Zeus. He is generally symbolised in human form but occasionally with a beetle's body lion's feet etc.

**Ammonal**, an explosive consisting of ammonium nitrate and aluminium. See also ALUMINIUM.

**Ammonia**, formula  $\text{NH}_3$ , is a gaseous compound of nitrogen and hydrogen. The gas is lighter than air, non-inflammable and extremely soluble in water. It has a strong characteristic smell. Gaseous ammonia was first isolated by Priestley in 1774.

Whilst large amounts of ammonia and its compounds are to-day obtained from the ammoniacal liquor that is produced during the manufacture of coal gas (q.v.) the greatest proportion is at present manufactured synthetically by the direct union of the two constituent elements. The nitrogen is obtained directly from the air by fractional evaporation of liquid air and the hydrogen is obtained from purified water gas or else electrolytically. The two gases are passed together over a catalyst at a high temperature and pressure when a portion of them combine to form ammonia which is removed by absorption in water or else by liquefaction whilst the uncombined gases are re-circulated through the apparatus. See also CATALYSIS.

There are two processes working on this principle, the Haber of German and the Claude of French origin. The former is somewhat more widely employed, the principal difference between the two is that whereas the Haber is operated at a pressure of about 200 atmospheres the pressure employed by the Claude process is as



- A *Paloceras planorbe*  
 B *Arietites turneri*  
 C *Lipioceras capricornu*  
 D *Amaltheus margaritatus*  
 E *Lioceras opalinum*

## Ammonites

- F *Parkinsonia parkinsoni*  
 G *Macrocephalites macrocephalus*  
 H *Scaphites*  
 I *Macrocephalites*

- J *Ancylloceras*  
 K *Hamites*  
 L *Baculites*  
 M *Turrillites*

high as 1000 atmospheres. The temperature in each case is in the region of  $550^{\circ}\text{C}$ .

In industry the chief use of ammonia is as a refrigerant in ice-making machines. In early types of apparatus the cooling effect was obtained by blowing air through an aqueous solution of ammonia, the air carried the gas away from the solution, causing a drop in temperature. This method has now been superseded by the use of liquid ammonia, which is rapidly evaporated and then re-liquefied by cooling and compressing. Ammonia boils at  $-33.4^{\circ}\text{C}$  and melts at  $-77.7^{\circ}\text{C}$ . It can be liquefied by pressure alone at ordinary temperatures.

**Ammonia Dynamites**, see EXPLOSIVES.

**Ammonites** are extinct cephalopod molluscs related to the *Nautilus* (*qv*), from forms akin to which they were descended. They were marine, confined to the Mesozoic epoch, and derive their name from the resemblance of the shell to the ram's-horn ornaments on the front of the temple of Jupiter Ammon.

Typically, they are shells rolled in a plane spiral and divided into a series of chambers, in the outermost of which the animal lived, the others being empty, but traversed by a siphon or tube running the whole length of the shell. In their later geological history, however, this form of shell frequently gave place to one which was straight, hooked, or spirally coiled like a snail, in fact, in the Cretaceous period, the shells were of almost every imaginable shape.

Ammonium

Amnesia

The earliest ammonites are not found in this country as they were evolved in the Triassic period and at that time England was dry land. They are however found in the Alps. When the next submergence took place the sea of the Liass period invading England from the S brought with it ammonites fully evolved and these speedily became the most successful animals of the period. Their power of specialisation and at the same time of adaptation to the conditions prevailing was extraordinary yet no individual species survived for long. It has been suggested that over specialisation rendered them incapable of adaptation to slightly changed geological conditions.

It is the short life of each species which makes the ammonite important to the geologist and renders them such excellent fossils for zoning a sequence of beds. In Dorset the Liass beds have been divided by this means into layers in some cases only about an inch thick.

Ammonites became extinct at the close of the Cretaceous period when there was a fairly general change of conditions either because again they had lost the power of adaptation or else as those geologists who draw a parallel between the individual and the race affirm the whole race of Ammonites was old and dying out in any case. Anyway it is significant that the related specialised nautilus a form much older than the ammonites has survived to the present time.

Ammonium the radical  $NH_4$  behaves in many ways like an alkali metal element such as sodium even to the extent of giving an amalgam with mercury. Ammonium does not exist in the free state but only as the basic radical of compounds. The basic itself is ammonium hydroxide  $NH_4OH$  of which ammonia is the anhydride. Ammonium hydroxide is never met with in the pure state (although it can with great difficulty be so obtained) but in the form of a weak aqueous solution which also contains ammonia in solution.

Ammonium hydroxide solution finds many uses in industry the chief of which are as a chemical reagent in the rubber and plastic industries and as a detergent. It is also used in the manufacture of artificial silk (q.v.).

The most important ammonium salt is the sulphate which is made from the ammoniacal liquor of gas works and also synthetically. It is employed as a fertiliser.

Ammonium nitrate is a highly oxygenated substance largely used in the manufacture of explosives. When this salt is dissolved in water heat is absorbed and for this reason ammonium nitrate is sometimes used for portable refrigerators of very small capacity. The production of cold by this method is however very expensive.

Ammonium carbonate also known as sal volatile and Hartshorn is used in medicine as a stimulant. It is also the principal constituent of smelling salts.

Ammonium see GUNS EXPLOSIVES

Amnesia, a psychological term for forgetfulness or loss of memory. It implies the withdrawal of certain facts from consciousness. The years of childhood from the dawn of consciousness to the age of from 5 to 7 which are usually so rich in psychic life (see CHILD PSYCHOLOGY) are with few exceptions buried beneath an amnesic layer. Psycho-analysis considers that all forgetting is psychopathological. We forget only that which we do not wish to remember though the wish may be unconscious. Consciously we may be determined to keep an appointment yet unconsciously eager to avoid doing so. This may result in our forgetting not necessarily the engagement but its date and so allowing the day to pass. In such a case the mistake is invariably recovered but not until it is too late for the fulfilment of the engagement. Everything to post a letter falls into the same category but the unconscious determinant may vary from a desire to punish oneself to the wish to attain a superior.



BALLET: "LES PRESAGES"

## Amygdales

145

## Anachronism

Amygdal runs a very sinuous course of c. 300 m. before it enters the Sea of Okhotsk in a N.E. direction opposite Sakhalin. Its chief tributaries are the Sungari and the Ussuri both on the right bank. The Ussuri affords a passage to Vladivostok. Amygdal is navigable for small vessels to Blagoveshchensk. (?) Province of the Far East area of USSR N. of Manchuria. Mines are important—gold, iron and coal. Stock raising, furs and timber are large industries. Pop. 344,000.

**Amygdal** see BASALTS VOLCANIC ROCKS

**Amygdalum** (a mig na tiv) a glanule (qv) found in the bitter almond and some other fruits. It consists of a compound of glucose, benzaldehyde and hydrocyanic acid and is the formula  $C_{10}H_{12}NO$ . It can be obtained in the form of a crystalline compound. It is decomposed into its constituents by the action of an enzyme *emulsin* which also occurs in the bitter almond.

**Amyl Acetate** (*Panana oil*, *Pear oil*) is a colourless liquid having the formula  $CH_3COOC_4H_{11}$ . It boils at 148°C. and has a very pronounced odour of pear drops. It is obtained by the action of acetic acid on amyl alcohol, sulphuric acid being used as a catalyst.

Amyl acetate finds a large number of uses in industry: the principal is as a solvent for nitrocellulose, chiefly in the manufacture of the various types of nitrocellulose lacquers. It is also used as a solvent for other purposes in perfumery and as a flavouring material.

Amyl acetate is inflammable and is used as the illuminant in the standard lamp used in photometric measurements.

**Amyl Alcohol.** The amyl alcohol of commerce consists as a rule of a mixture of the various isomeric amyl alcohols of the formula  $C_5H_{11}OH$ . There are eight alcohols corresponding to this formula of which the commonest is primary iso-amyl alcohol obtained by the fractional distillation of fusel oil, which is the residue left

after the ethyl alcohol in the fermentation process for the manufacture of the latter has been distilled off. The other amyl alcohols obtained from fusel oil is a secondary alcohol so called in account for its activity. Fermentation alcohol is obtained from fusel oil and the two above mentioned are its principal constituents. It is used in the manufacture of airplane dopes.

Amyl alcohol is extremely toxic and is fatal in large quantities. It is dangerous by inhalation of the vapour must be taken when it is used.

**Amylase** (a mil iz) a catalytic enzyme for the carbohydrate plitting (nzyme better known as *diastase* (qv)).

**Amyl Nitrite**  $C_4H_9NO$  is a colourless liquid with a boiling point 60°C. and a peculiar fruity odour. Amyl now finds a considerable use in medicine as a heart stimulant. It is administered by inhalation, chiefly in cases of angina pectoris. Inhalation of amyl nitrite causes considerable dilatation of the blood vessels and one of the first signs seen is a violent flushing of the face and neck.

**Ana**, a term applied to the class of such work as *Benthams* or *Scaliger* as a that a collection of *obiter dicta* stray thoughts and interesting references relating to those respective authors.

**Anabaptists** a Christian sect which flourished in the 16th cent. who disapproved of the practice of infant baptism. They achieved fame more for their political than their religious views. They carried the teachings of the Reformation to their logical conclusion by attempting to establish their own form of government, a communistic system under the rule of religious leaders at Munster in Westphalia. They also played a part in the Peasants War (1525).

**Anachronism**, the chronological confusion of representing as co-existent things that never could have existed at the same time. Strictly the term



should be applied to the anticipatory introduction into a reference to or description of past history of something which did not come into existence until later. A famous example is the reference to a striking clock in Shakespeare's *Julius Cæsar*.

**Anacoluthon** [ANŌKŪLŪTHON], the term applied to a sentence, of which the second part is not the grammatical consequence of the first. Many examples, in the form of a sudden change from indirect to direct speech, are to be found in the Authorised Version of the Bible.

**Anaconda**, the largest American snake. It is akin to the boa-constrictor, and may reach a length of 20 ft. It frequents the banks of the large rivers of tropical S. America, and feeds upon deer, monkeys, and other mammals and birds.

**Anacreon** (6th cent. B.C.), Greek poet, born in Ionia, lived in Thrace with Polycrates of Samos, in Athens, and in Thessaly. He was a popular lyric poet in court circles, and was patronised by Hipparchus of Athens, in whose honour he wrote a number of odes, only fragments of which are extant.

**Anacreontics**, the name given to a collection of Greek poems, some of them as late as A.D. 500, ostensibly in the manner of Anacreon (q.v.), and including the famous *Ode to a Grasshopper*. The term is also applied to the prevailing metre of those poems ("When Love was in the Roses"), and, to a certain extent, to their prevailing topics of Love and Wine. These poems have had their imitators and translators at various periods in most literatures, notably in French and English. Herrick and Cowley among imitators, and Stanley and Thomas Moore among translators may be mentioned.

**Anæmia**, see **Blood**.

**Anæsthetics**, chemical substances which have the power of rendering human beings and animals insensitive to touch and pain for varying lengths of time. The use of soporifics, i.e. drugs producing sleep, as a substitute

for anæsthetics may be traced back to the childhood-days of the human race. e.g. mandrake, opium, Indian hemp, and hemlock. These were the ingredients of soporific sponges employed in the Middle Ages to produce surgical anæsthesia. Ether, chloroform, and nitrous oxide were first used in the early 19th cent. as anæsthetics.

Besides abolishing physical suffering and pain, the introduction of anæsthesia into surgery also lulled the mental terror of anticipation, with the result that a new and tremendous impetus was given to the advance of surgery. The following are the most common anæsthetics employed in modern practice.

(1) *Nitrous Oxide*, or "laughing-gas," so named because it may produce marked exhilaration when mixed with air and inhaled. Popularly known as "gas," it is used for dental extractions and for short operations. For more prolonged operations, a mixture of nitrous oxide and oxygen may be administered. Nitrous oxide is safe, produces no after-effects, and, where skilfully given, is the most pleasant of all anæsthetics. It acts (a) by paralysing the controlling centres of the brain, (b) as an "indifferent" gas by producing asphyxia.

(2) *Ether*, the favourite anæsthetic for surgical operations. Since, however, it is unpleasant to take, it is customary to induce the patient with gas or with ethyl chloride. Ether may be administered by the open method, i.e. dropped into a gauze mask held over the face, or by the closed method, i.e. inhaled from a rubber bag, or through a tube passed down the windpipe (endotracheal method). Ether is a comparatively safe anæsthetic, though in elderly subjects it may irritate the respiratory passages and cause bronchitis or pneumonia. As it is inflammable, it must not be used near an open flame.

(3) *Chloroform*, which is so unpleasant to take as ether, and more powerful in its action. It is not inflammable, and does not irritate the

air passages. It is however not devoid of danger for it may irritate the heart so that this suddenly stops beating and it may produce what is known as delayed chloroform poisoning a condition in which the liver is damaged. It is extensively used to deaden the pain of childbirth.

(4) *Ethyl Chloride* a liquid which quickly vaporises at room temperature and is kept in closed tubes provided with taps. With the addition of a little eau-de-Cologne it is the most popular anæsthetic for short operations on children. It is rapid and safe and usually has no after-effects.

*Local Anæsthetics* used in the form of a spray or by injection, produce insensibility of part of the body. Cocaine, novocaine and local ethyl chloride are examples.

*Spinal Anæsthetics* are drugs such as percaïne which injected through the backbone (vertebral column) into the space surrounding the spinal cord produce complete surgical anæsthesia in patients unsuited for a general anæsthetic.

Of recent years the method of pre-medication has been introduced into anæsthesia whereby a patient while remaining in bed is rendered unconscious by drugs given by the rectum or injected into a vein. He is then taken to the operating theatre where he is anæsthetised in the usual way. Nervous subjects may thus go under without realising that they are about to have their operation.

The law insists that all deaths taking place under an anæsthetic must be reported to the coroner.

**ANAGALLIS** (AND-GAL-LIS) the genus containing the Scarlet Pimpernel or Poor Man's Weather glass and a number of favourite garden perennials which are ideal rock plants. Flowers are bright scarlet blue yellow and white. Suitable for dry sunny soil and also for pots.

**Anagram**, the transposition of the letters composing one or more words or more new words usually

involving some point of allusion or connection in meaning. e.g. Slyware is an anagram of Lawyers.

**Analogy** (biol.) or homophy is the superficial resemblance of organs of very diverse origin but adapted for similar functions. The wings of insects (qv) are outgrowths of the skin, the wings of birds (qv) are supported by an internal bony skeleton but both types of wing are well adapted for flight. The leaf-like stems or phyllodes of Butcher's Broom (*Fuscus acutifolius*) perform the work of photosynthesis (qv) carried on by green leaves but though function and external form are similar the origin of leaf and phyllode is different. Thus like wings of birds and insects they are examples of analogous structures. (See also ANATOMY AND EXTERNAL MORPHOLOGY.)

**Analyst**, Public an official appointed by a local authority under the Sale of Foods and Drugs Acts to check the purity of foodstuff exposed for sale.

**Analytical Chemistry** is the science of methods by which the chemical composition of compounds, substances or mixtures is ascertained. It is divided into two branches, qualitative and quantitative analysis. The former is concerned merely with finding out what substances are present while the latter deals with the determination of the actual relative proportion by weight of each substance.

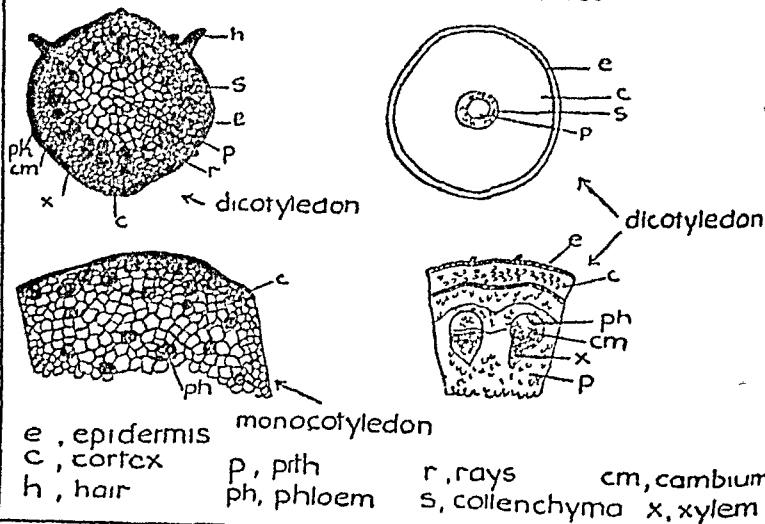
*Qualitative Analysis* of inorganic substances is usually divided into the dry way and the wet way. The dry way is of great practical importance in mining and prospecting since it can be carried out by very simple and readily portable apparatus. It requires a good non-luminous flame which should be capable of ready adjustment so as to give both oxidation and reduction but a skilful experimenter is able to operate quite satisfactorily with a candle or oil lamp and a simple mouth blow pipe. The substance is heated on platinum wire in the flame and a rough estimate of its melting point is made, the colour of

when Goethe reviewed morphology as a science synthesising all the facts of the structure and development of organisms. His treatise, *The Metamorphosis of Plants*, was synthetic in its demonstration that such various forms as floral and foliage leaves, and cotyledons, were homologous, and modifications of a single primitive type of outgrowth. Goethe extended his synthetic study of morphology to

cases, organisms having analogous structure of very different origin were grouped together. As investigation of the development of structures advanced the importance of homology was recognised and the classification amended.

*The Anatomy of Animals* is described in the articles on the circulatory, digestive, excretory, nervous, respiratory, and urogenital systems (q v).

## TRANSVERSE SECTIONS OF THE STEMS OF FLOWERING PLANTS



### Anatomy and External Morphology (1)

the form of the vertebrate skull and skeleton. Haeckel (q v) carried the synthesis farther, expressing the view, held also by Gegenbaur, that the common descent of animals could be traced by homology (q v), and that morphology was consequently of fundamental importance in evolution.

The earlier descriptive work led to classifications (q v) of plants and animals. These classifications were based on form, while the mode of development of the form was still unknown. Consequently, in some

**Methods of Study** One of the main methods of anatomical study is by means of dissection, a process familiar to every medical student, and to botanists and zoologists. Skillful dissection exposes any entire system and organ, either of a plant or animal, and microscopic technique, accompanied by delicate precision, has made even the dissection of a cell possible. Cells have been enucleated, and chromosomes removed from nuclei, with the object of discovering the effect upon development.

## Anatomy

## Anatomy

In addition to analytical study synthetic methods have proved invaluable. The building up of a multicellular organism by the growth of a single cell shows the development of form and thus embryology (*qv*) contributes its quota to the study of morphology.

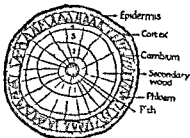
**The Anatomy of Plants** The higher plants consist when very young of an epidermis forming the external boundary of the plant and covering a mass of fundamental or ground tissue. Later this is differentiated into a core of ground tissue or pith (*P*) and a cylinder of ground tissue the cortex (*C*) between the epidermis (*E*) and the stele (*S*) (see diagram). The epidermis is often lost except on the leaves and replaced by other tissues. By the activity of groups of cells constituting cambium (*qt*) strands of conducting and supporting tissues are differentiated and form vascular strands continuous throughout leaf stem and root. The cambium (*Cm*) forms phloem (*Pb*) or bast (*qv*) externally and wood or xylem (*qv*) internally. In the root xylem and phloem alternate in stems and leaves they are collateral and form vascular bundles. In dicotyledons and gymnosperms (*qv*) the bundles are arranged in a single ring. In monocotyledons they are in concentric rings and appear scattered. This distribution of mechanical tissues affords more support than the same amount of tissue arranged as a solid central core could give.

With increase in height girth and mechanical tissue must increase if the plant is to remain erect. More mechanical and conducting tissue is produced by the cambium which forms a continuous ring extending between the bast and xylem and through the adjoining ground tissue. Additional strengthening tissue is often formed under the epidermis and in the corners of angular stems those of dead nettles for example.

Radial growth of the wood and phloem in spring and summer and

slower growth in autumn and winter cause them to appear as alternate rings of light-coloured elements and narrow rings of darker ones. These annual rings are particularly well seen in the xylem. The increase of internal tissues puts a great strain on the external ones which ultimately split. Before the rupture some of the outer cortical cells form a cambium producing cork cells externally. These prevent loss of water and constitute the bark of trees and shrubs. As more vascular tissue is added new bark is formed internal to the old which is then shed.

For the anatomy and external



Anatomy of External Morphology (2).

morphology of flowerless plants see articles on ALGAE FERNS FUNGI LIVERWORTS and MOSSES and for the microscopic structure see CELL.

#### External Morphology of Plants

The higher plants show differentiation into root stem and leaves.

Roots form either tap root systems consisting of a distinct main root with lateral branches or fibrous systems having a number of roots approximately equally developed. Although roots are sometimes modified and serve as organs of respiration as in certain manroves or as protective spines as in some palms as fixing organs growing from the stems of ivy or in certain parasites as penetrating organ terminated by suckers which enter the host they show few remarkable modifications of external structure.

Stems branch in various ways and

may be cylindrical, flattened, angular, metamorphosed into spines, phyllodes, and tendrils, but study of development shows that all these structures with such different external forms are homologous.

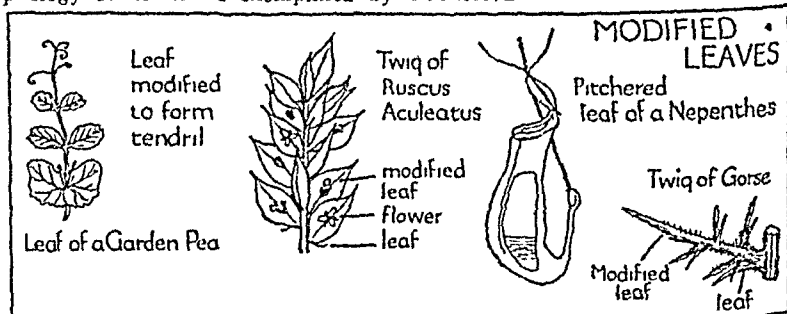
Similarly leaves, typically flattened and green, simple or compound, palmate or pinnate, may be metamorphosed into spines, minute scales, tendrils, pitchers, of insectivorous plants, sepals, petals, stamens and carpels of flowers, and storage organs. Again, anatomy reveals the homologous nature of these diverse forms.

The diversity of the external morphology of flowers is exemplified by

investigation. His theories regarding the structure of the universe were opposed to popular superstition, and Anaxagoras was charged with undermining established dogma, and, though acquitted of the charge, left Athens. He laid the basis of the atomic theory. He was a friend of Pericles, Euripides, and Socrates.

**Anaximander**, Greek philosopher (6th cent. B.C.), was a pupil of Thales of Miletus. He is said to have been the first Greek map-maker, and to have initiated the study of first principles in natural science.

**Ancestor Worship**, see RELIGION, PRIMITIVE.



Anatomy and External Morphology (4)

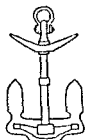
orchids, buttercups, and daisies, and is described in the articles on various flowers, and *pollination* (q.v.).

**Importance of Anatomy and External Morphology** Although some writers regard anatomy and external morphology as of little practical value except in medicine (q.v.), where pathology may have a morphological foundation or expression, and in psychology in the correlation of that science with the structure of the nervous system, it is essentially one of the two main branches of biology, and is closely associated with physiology. The entire science of biology is included in the study of form and function. See also ANALOGY, BIOLOGY, EMBRYOLOGY.

**Anaxagoras of Clazomenae** (c. 500-425 B.C.), Greek philosopher and one of the pioneers of scientific and astronomical

**Anchor** is a device which, when attached to the end of a chain or rope, automatically grips suitable ground on the chain or rope being subjected to tension. The simplest and commonest form of anchor consists of a straight bar having at one end a straight cross-bar, called the stock, and at the other a pair of curved flukes. It is easy to see that as the anchor lies on the ground a pull on the chain tends to cause the fluke to dig into the ground. The object of the stock is to cause the anchor to take up the most favourable position when thrown to the ground in any way. The purpose of the chain is to weigh the anchor when the cable is pulled. For this reason rope is very unsatisfactory as a substitute, and an anchor will hold a ship satisfactorily only if the chain cable is of

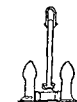
# ANCHORS



stowing anchor



mushroom anchor



stockless anchor



admiralty anchor



stockless anchor

sufficient length to allow of the anchor lying with its shank on the ground. The greater the pull on the anchor (from wind or tide) and the deeper the water the more chain must be let out from the ship. On the other hand if the anchor chain is of excessive length an anchor is more easily fouled when the direction of wind or tide changes. The fouling is caused by the

chain becoming wound round the upper or free fluke whereupon the anchor is at once pulled out of the ground.

Large vessels no longer use this type of anchor but one in which the flukes are swivelled on the shanks there being as a rule no stock. The illustration shows how this type of anchor works. It will be seen that both flukes bite

into the ground at once and that they are induced to do so by a projecting shoulder which swivel fluke anchor in ground turns their points downwards as the anchor drags along the ground.

The ground tackle consists of an horseshoe chain cable and the necessary shackles and other fittings.

**Anchovy** a small strong tasting fish of the herring family (see HERRING) common in the Mediterranean and known in the English Channel.

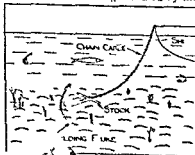


Diagram with stock shows holding in the ground



Swivel Fluke Anchor in ground turns their points downwards as the anchor drags along the ground

**Ancient Light**, in law, the absolute right to the access and use of light in a building. The right exists only in respect of windows, and may be acquired by 20 years' continuous enjoyment of light otherwise than under an agreement or consent in writing. The erection by another person of any structure which shuts off the light is a breach of the right, giving rise to an action for damages and an injunction.

**Ancona**. (1) Province of N E Italy between Umbrian Apennines and the Adriatic. Interior mountainous, with fertile coast plain. Fruit, silkworms, cereals, sulphur mines. Area, 750 sq m, pop (1931) 356,900. (2) Town, capital of above, Romanesque cathedral (1189), good harbour, sugar-refinery, shipbuilding. Founded as a Greek colony from Syracuse, 390 B C, important in the time of Trajan, in whose honour a triumphal arch (still standing) was erected in A D 115. One of the cities of the Pentapolis under the Exarch of Ravenna, later brought into Papal territory. Pop 84,400.

**Ancre** [AN-K'R], a small tributary of the Somme in N E France, it rises near Bapaume, and threads the chalk country past Albert, joining the main river a few miles E of Amiens. The valley of the Ancre and the neighbouring highlands were the scene of the desperate fighting during the 1st and 2nd battles of the Ancre (1916 and 1917), the prolonged British offensives which led to the German retreat to the Hindenburg Line. In 1918 this district was again involved in successive German and British offensives.

**Ancren Riwle**, i.e. "Rule of Anchoresses or Nuns," is the title of a manual of instructions for the guidance of a small community of religious women at Tarrant Crawford in Dorset. It is written in English prose of the 12th or 13th cent., in a straightforward and simple style, and the severity of its precepts are tempered by a certain humanity of outlook.

**Ancrum Moor, Battle of**, Feb 17, 1545 the Scots, under the Earl of Angus, Scott of Buccleuch, and the Master of Rothes, severely defeated the force of Henry VIII under Sir Ralph Eyre and Sir Brian Latoun, whose contingent of Borderers had deserted to the Scots.

**Andalusia** [AN-DŪ-LŌŪ-SĒ-Ū] (*Andalucía*), most S of the ancient provinces of Spain, broken up in 1833 into provinces of Almería, Cadiz, Córdoba, Granada, Huelva, Jaen, Málaga, and Sevilla. Province embraces Sierra Morena, the Guadalquivir lowlands, and Sierra Nevada.

**Products** The valley of the Guadalquivir is one of the most fertile regions in Spain, and olives are everywhere cultivated. Oranges are grown to a less extent. Sub-tropical plants, e.g. sugar, cotton, and cactus, can be cultivated in lower valleys. Minerals of the Sierras are important, especially lead and copper (Rio Tinto). Of the other products of the region, sherry (wine of Xeres) is celebrated. Chief towns: Cadiz, Huelva, Málaga, Almería, Granada, and Sevilla.

**History** Andalusia preserves in an orientalised form the name of the Vandals who conquered Spain in the 5th cent., though other explanations have also been advanced. This was the first part of Spain to fall to the Saracens (A D 711), and the last to be evacuated by the Moors. The alien conquerors have left a deep impression on the architecture of Andalusia and on the character of its inhabitants.

**Andaman and Nicobar Islands** Two groups of islands in the Bay of Bengal, between Cape Negrais and Sumatra, c. 600 m S S E of the Hugli, jointly constituting a province of British India. They are c. 200 in number, fringed in places by coral reefs, and consist of peaks of submerged mountain chain. Densely forested and hilly. Timber and tropical crops (coffee, etc.) Penal settlement of Indian Government. Inhabitants a very primitive pigmy race, apparently

## Anderida

of negroid stock Capital Port Blair  
Area 3100 sq m pop 99,000

**Anderida, Forest** of Roman name for the Weald (q.v.) of Kent Sussex and Surrey The Roman fort of Anderida has been identified with the ancient wall surrounding Pevensey Castle Sussex

**Andermatt**, village in Canton Uri Switzerland situated on Upper Reuss Health resort and strategic point on St. Gotthard route Pop c 900

**Andersen, Hans Christian** (1805-1875) Danish poet and writer His celebrated series of children's stories written from 1829 to as late as 18 is collected under the title *Hans Andersen's Fairy Tales* The best of these will stand the test of any criticism retaining as they do the inimitable qualities of the German *Märchen* of the Brothers Grimm and adding to this the individual touch of the author's own large humanity

**Anderson, Elizabeth Garrett** (1836-1917) pioneer in opening the medical profession to English women studied medicine in London from 1860 but was debarred from full studentship and from taking her examination The London Society of Apothecaries admitted her in 1865 and as general medical attendant at St Mary's Dispensary (1866) she helped to develop the institution into the New Hospital for Women She was granted the degree of M.D. (Paris) in 1870 continued her medical and public work and in 1909 was elected the first woman mayor in England for her native town of Aldeburgh

**Anderson, John** (1726-1790) Professor of Natural Philosophy in Glasgow University worked on the application of science to industry The Glasgow and West of Scotland Technical College now incorporates **ANDERSON'S COLLEGE** which he founded by bequest

**Anderson, Mary** (Mary de Navarro b 1809) American actress of renowned beauty commenced her stage career as Juliet in 1875 was acclaimed throughout an American tour and

played in Shakespearean and other productions in England where she settled on her marriage in 1870

**Anderson, Sir Robert** (1811-1918) criminalist adviser in political crime to the Home Office (1869) head of the Criminal Investigation Department London (1888-1901) and author of the 1897 *Times* article 'Fingerprinting and Crime'

**Andersson Karl Johan** (1877-1897) Swedish explorer in Africa made the first systematic exploration of Bechuanaland and traversed wide areas of little known country His accounts are contained in *Lake Ngami* (1896) and *Notes of Travel in South Africa* (1897)

**Andes** The principal mountain chain of S America and the longest



Aconcagua the highest peak of the Andes

continuous mountain range in the world reaching from the Venezuelan coast to the S extremity of Patagonia and continuing into the island of Tierra del Fuego The range has a general direction N and S close to the W (Pacific) coast of the continent. In Tierra del Fuego and S Patagonia however the trend is nearly E to W and in Peru the range bends sharply NW resuming the N direction in Ecuador Length c 4400 m

The Andes are not a single continuous line of summits as was once supposed but consist of parallel ranges (*cordilleras*) imposed on a common broad and deeply eroded base Volcanic mountain ranges rise above a folded base of ancient sedimentary rocks which have suffered the intrusion of more recent granites



and mica-schists. The Primary series (old sandstones) is conspicuous on the E plateau as far N as Bolivia. Secondary rocks (conglomerates) cover most of the W plateau from Peru S. In the N section conditions are reversed, and the secondary rocks are most prominent on the E plateau. The Colombian *cordilleras* are built of mica-schists, from which the sedimentary rocks have been almost completely denuded. Limestones are a prominent feature in E Peru.



Andes Gavilan Pass and Peak

S of the Equator the Andes consist generally of two parallel chains with a medial plateau which broadens into the Bolivian tableland, c 500 m wide. The range contracts again in Peru, where the tableland is cut down by longitudinal river valleys (Marañon, Ucayali). N of the Equator the range bifurcates into four main chains. The Andes trend downwards at their extremities, the highest summits are in Chile, Bolivia, and Ecuador. The depression of the extreme S of the chain has produced a drowned mountain coast with lake fiords. The mean height of the range is estimated at c

13,000 ft. Chief summits Aconcagua (22,000 ft), Illimani (21,000 ft), and Sorata (21,400 ft). In Ecuador there are nearly 20 volcanic peaks over 15,000 ft, including Chimborazo (20,700 ft) and Cotopaxi (19,500 ft). Sorata alone of the great peaks is not a volcano.

**Glaciation** The position of the snowline varies considerably. In the extreme S it is only 2500-5000 ft above the sea, and thus is the most strikingly glaciated part of the range. On account of the extreme aridity of the tropical belt the snowline is as high as 18,000-20,000 ft. The heavy tropical rainfall lowers the limit of snow to about 16,000 ft in Ecuador. Glaciers descend to the lower valleys only S of lat 40°, and glaciation is a less striking feature of the Andes as a whole than of the other great ranges of the world.

**Drainage** The Pacific drainage of the Andes is unimportant, many of the rivers are dry in summer, and the longest are too short to be of much value as a means of communication. The E drainage is much more important, as the principal sources of the Amazon (*qv*) rise from the glaciers of Bolivia and Peru. Lake Titicaca, 12,000 ft above the sea on the Bolivian plateau, is the highest centre of inland drainage in the world.

**Vegetation** Much of the chain is very sterile. In the S section, in the zone of the W winds (S of lat 35°), the lower slopes are well forested, and in the region of the equatorial rains there are important areas of cultivation above the tropical forests (coffee, cacao, etc.).

**Minerals** The Andes are extraordinarily rich in minerals, especially in Peru and Bolivia (*qv*). Mineral resources include the precious metals, copper, iron, tin, manganese, bismuth, mercury, borax, and nitrates. Potosí in Bolivia has been famous for centuries for its silver mines, but the output has greatly declined during the present century.

**Communications.** There are great

Andesites

André

natural difficulties in the way of communication across the Andes. The passes from the Pacific States to Brazil and the Argentine rise to 11 000 ft and over. Only two rail ways afford access across the chain. The line from Buenos Aires to Bolivia connects with a steamboat service on Lake Titicaca which links up with the Peruvian and N Chilean railways the only genuine trans Andine rail way runs from Valparaiso to Buenos Aires through the Uspallata Tunnel - m long and 10 500 ft above the sea.

Andesites are darkish lavas intermediate between rhyolite and basalt (qt.) They vary much in colour texture and mineral composition. Typically the crystals embedded in the ground mass are felspar dark mica and related minerals. Dark grey is the commonest colour. When darker andesites grade into basalts from which they may be distinguished by the broken thin edges being translucent to strong light. From rhyolites they are distinguished by the absence of quartz crystals in the ground mass. Andesites are very abundant being the chief products of volcanoes surrounding the Pacific Ocean. They take their name from their prevalence in the Andes Mountains.

**Andijan** (1) Province of Uzbekistan (q.v.) Fertile watered by Syr Darya cotton silk fruit cereals ( ) Town on left bank of the Syr Darya terminus of Transcaspiian Railway cotton manufactures governmental centre of (1) famous gardens. Formerly capital of khans of khokand 10p province c 00 000 town c 75 000

**Andron** (ANDRON) firedog metal support on short legs for burning logs on a hearth. The front upright bars of 17th-cent andirons as well as the guard connecting them were often elaborately ornamented. The metals used were iron bronze copper and even silver.

**Andorra** (ANDORRA) in E Pyrenees between France and Spain occupied by a small community of m little tobacco is

grown and stock raising is carried on. Andorra is a relic of feudal polity and pays a small tribute to France and Spain as joint suzerains. France occupied the district for a time in 1933 owing to alleged maladministration. The Andorrans live a primitive pastoral and semi nomadic life and are governed by an elected council. smuggling is an established institution. Area 190 sq m pop 5 00

**Andover** Hampshire town c 15 m NE of Salisbury on the R. Anton. Iron founding and malting are carried on and there is a large trade in agricultural produce. The Royal Air Force Staff College is here. The town dates from c the 10th cent and was early noted for its woollen trade which has now declined. Pop (1931) 909

**Andrássy Julius, Count** (18 3-1890) Hungarian statesman cent red politics as a Radical member of the Diet in 1847 was exiled on the resumption of repression in 1849 and granted an amnesty in 1858. Then as first Hungarian constitutional Premier in 1867 and as Foreign Minister for Austria Hungary in 1871 he re-established a friendship with Germany and increased Austria Hungary's influence in Europe. He resigned owing to the unpopularity of his acceptance of the protectorship of Bosnia and Herzegovina at the Congress of Berlin but as a moderate constitutionalist in the Upper House he regained favour and his death was regarded as a national calamity. His son **COUNT JULIUS ANDRÁSSY** (1860-19 9) was Minister for the Interior in the 1906 Coalition Government. He supported the Ministry during the World War was the last Foreign Minister under the Dual Monarchy and was instrumental in obtaining a separate peace treaty for Hungary. He was later leader of the Christian National Party and a Legitimist deputy in the National Assembly.

**André, John** (1751-1790) British soldier in the American War of Independence detailed to negotiate

with the American Benedict Arnold (qv), who was to betray a fortress on the Hudson R. André was captured in New York while escaping from the American lines with the required information, and was hanged as a spy. Buried in Westminster Abbey.

**Andrea del Sarto**, see **SARTO**, **ANDREA** III

**Andrée** [AN-DRA'], Salomon August (1851-1897), Swedish explorer, attempted to float over the N Pole in a balloon in 1897 leaving Danes Island, Spitzbergen, in July. Nothing was heard of his party and searches were abortive till in 1930 Norwegian survey ships found the bodies on White Island. Andrée and his two companions had perished while tramping across the ice. Their last diary entries had been made in Oct. 1897.

**Andrew, St.**, first disciple of Jesus, and brother of St. Peter, is traditionally said to have been crucified on a diagonal cross while preaching at Patras in Greece. He is the patron saint of Scotland, his feast day being Nov. 30, and was honoured also in Russia, where Peter the Great founded *The Order of St. Andrew* in 1698. St. Andrew's cross is the flag of Scotland, and is incorporated in the Union Jack.

**Andrewes, Lancelot** (1555-1626), bishop, and one of the most scholarly theologians of the Anglican Church, was successively Dean of Westminster (1601), and Bishop of Chichester (1605), Ely (1609), and Winchester (1618-26). He assisted in the translating of the Authorised Version of the Bible, and was in favour at Court, though he concerned himself little with temporal matters. His *Præces Privatae* are still used for devotional purposes.

**Andrews, Thomas** (1813-1885), Irish scientist, was Professor of Chemistry at Queen's College, Belfast, from 1845 to 1879. His main contribution to science is the establishment of the theory of continuity in the passage of gases to a liquid state.

**Andréyev, Leonid Nicoláevich** (1871-1919), Russian novelist and playwright, exceedingly popular in his day.

His short stories have a gruesome character reminiscent of Poe and are gripping and well written. Among the best of them are *The Abyss*, *The Grand Slam*, *Ghosts*, and *In the Fog*.

**Androcles** [AN-'DRO-KLIZ], a Roman slave who, according to Gellius, took a thorn from a lion's injured paw while hiding in a cave. When recaptured and thrown to the lions in the arena, Androcles was recognised and forgiven on by the lion, and as a result was set free.

**Andromache** [AN-DRO'-VA-KE], in Greek legend, wife of Hector of Troy, was allotted as wife to Pyrrhus at the sack of Troy, but was later left to Helenus, brother of Hector. Andromache is a prominent character in the *Iliad* and *Racine* has written a play around her.

**Andromeda** [AN-DRO'-ME-DÖ], in Greek mythology, daughter of Cepheus of Ethiopia, was chained to a rock and exposed in order to appease a sea monster sent by Poseidon to devastate the kingdom. Perseus killed the monster, and rescued and married Andromeda, who on her death was placed in a northern constellation (see **CONSTELLATIONS**).

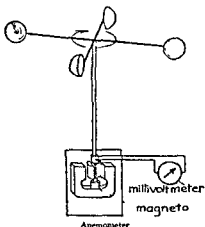
**Andromeda** (bot.), attractive evergreen hardy shrubs of low stature, from N. America. They require a semi-shady site and a light peaty soil. The flowers are much like those of lily-of-the-valley in May, and some of the species assume beautiful tints in their foliage in autumn.

**Andronicus** [AN-DRO'-NI-KÖS], name of three E. Roman emperors. Andronicus I Comnenus (1183-1185) captured Constantinople from the Emperor Alexius II, ruled well, but was subsequently overthrown and cruelly killed. Andronicus II Palæologus (1282-1328) abdicated after warring with the Turks, he died 1332. Andronicus III (c. 1296-1341), the rebellious grandson of Andronicus II, continued the Turkish war, and lost territory to the Serbians.

**Androsace** [AN-DRO-SÄS], small Alpine plants with moss-like foliage,

favourites for the rockery. They should be protected in a frame throughout the winter. The different species flower throughout the summer.

**Anemometer** instrument for measuring the rate of motion of air or oil or gas. The simplest type is the cup anemometer usually a vertical rotating shaft geared to recording mechanism and carrying at its upper end 4 equal horizontal rods to which are attached hemispherical cups. These oppose a greater resistance to the air current when their open ends face it than when it blows on the rounded



surface and hence the cups revolve at a speed roughly proportional to the wind speed. The instrument commonly drives an electric dynamo (or rather magneto with permanent magnets) and the voltage produced can be calibrated to show the speed of the wind. A simpler type of instrument has vanes in place of cups, the axis of rotation then being horizontal.

The cup anemometer has the advantage that its indication is independent of the wind direction. An entirely different type of instrument measures the velocity of the wind by means of the pressure generated in a

tube with an open end set so that the wind blows directly in. The most accurate device of this kind is due to Pitot and is described under Pitot Tube (p. 2).

An important development is the electrical hot wire anemometer in which the temperature of a platinum wire heated by a current and exposed to the air blast measures the force of the wind. The current heating the wire also operates an indicator showing its electrical resistance which depends on its temperature; this depends again on the rate at which the heat generated by the current of electricity is dissipated by the air current. This principle has been applied also to the construction of gas meters (p. 10). Types of anemometers which must be pointed directly into the wind are attached to weathervanes and swing with them.

**Anemone** (A N E M Ō N I) or *Wind flower* (from *Gr. anemos* the wind) it inhabits exposed places. Family Ranunculaceæ (Buttercup family). Two species are natives of Britain the Common Wood Anemone and the Pasque Flower which is rare. It has large solitary violet flowers and grows on high chalk pastures. About a hundred species are cultivated here; most of which are hardy though some do better in a cold frame during the winter. The stem of a good anemone should be strong elastic and erect, not less than 9 in. high; the flower at least 2½ in. in diameter consisting of large substantial well rounded petals at first horizontally extended and then turning a little upwards so as to form a broad shallow cup; the colour clear and distinct when diversified in the same flower or brilliant and striking if it consists only of one colour.

**Anemophilous Flower** one that depends upon the action of the wind for fertilisation; the pollen being carried by winds from plant to plant.

**Anacletus**, Pope from c. 7 to c. 83 traditionally the second successor of St Peter. He is also known as Cletus.

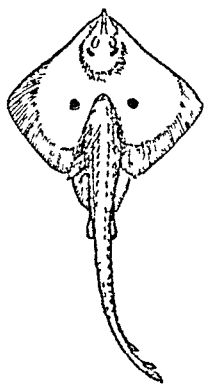
**Aneurism**, a localised dilatation of a

blood-vessel, caused by a weakening of the vessel wall either through disease or injury. Its chief danger lies in the possibility of its rupture. It may, however, exert harmful effects by pressure on, and interference with, neighbouring structures, the most important of which are nerves. See also **BLOOD-VESSELS, DISEASES OF**

**Angary**, in International Law, the right of a state in time of war to requisition property and ships situate in its territory but belonging to another state or its nationals.

**Angel** (1) A Greek word literally meaning messenger. In the Christian religion angels are supernatural beings, messengers of God. They are mentioned in the Old and New Testaments, but the idea developed fully in the early Church. The worship of angels was condemned by St Paul. (2) Coins circulating in Europe during the Dark and Middle Ages. An important issue in England was that of Edward IV, who used them chiefly for trading with the Florentines.

**Angel (or Monk) Fish**, akin to the skate and dogfish, and intermediate in shape between the two. It occurs in British waters, reaching a length of 5 ft. The name "Angel Fish" is also given to a beautiful aquarium fish from the Amazons, with enormous fins resembling the wings of an angel, as popularly conceived.



Angel Fish

**Angelica** is a common water-side perennial of little beauty as a garden plant, but cultivated for the stalks which are cut for candying, and used for cake decoration and as a sweetmeat.

**Angelico, Fra** (1387-1455), Italian painter. He took Dominican vows

in 1408, and led a saintly, self-denying life. In 1436 he went to Florence, and 10 years later to Rome. In both these cities are frescoes and altar-pieces of his of great beauty. Simplicity, depth of feeling, and pure and charming colour characterise his painting. These qualities are best seen in his frescoes at San Marco, Florence. Fra is represented in the National Gallery by the altar-piece, *Christ surrounded by Angels, etc*.

**Angell, Sir Norman** (b 1874), English publicist, lived in America until 1899 and has worked on the staffs of many newspapers, English, French and American. He has written many expositions of economic and monetary matters, including *The Money Game* (1928), a card-game from which the players can learn the elements of economics and commerce. His books include *The Economic Challenge and the Peace Treaty* (1919), *The Great Illusion* (1910), a condensation of war which has been widely translated, and *The Unseen Assassin* (1932).

**Angels-on-horseback**, a savoury consisting of an oyster rolled in bacon, fried and served on a croûte. Lemon juice, parsley, and shallot are generally used as flavouring.

**Angelus**, the bell rung three times during the day in Roman Catholic churches, to remind people to recite the *Ave Maria* (q.v.).

**Angers** [AHN'-ZHAR], town, France, capital of department Maine-et-Loire, on both banks of the Maine. Agricultural produce, iron-ware, slate. Angers was the former capital of the county of Anjou. It possesses a handsome 13th-cent cathedral, and a university. Pop 85,600.

**Angevin Dynasty** of English kings was the line from Henry II (son of the Count of Anjou) to Richard III, from 1154 to 1485. They are also called the Plantagenets.

**Angina pectoris**, a disease of the heart characterised by attacks of intense pain in the chest. It is more common in the male sex, and occurs

during middle age. It is caused by an impairment of the blood supply to the heart muscle at a time when the latter is called upon to perform extra work. This diminution of blood supply is probably due to a constriction of the mouths of the coronary arteries. The seizures come on in recurrent attacks which are aggravated by emotion, worry, exertion, excessive eating of rich food, or exposure to cold weather, and last from 5 to 6 minutes. They are characterised by a feeling of great dread and extreme pallor, but the pulse remains good and the blood pressure may even be raised. People who suffer from this disease must do nothing in excess. They should take mild exercise, small meals and avoid alcoholic beverages.

A new treatment perfected by a Russian Dr Schwartzman of Moscow has recently been introduced and has given much relief to sufferers.

**Angiosperms** [AN JUSPERMZ] or flowering plants are believed to be evolved from the *Gymnosperms*, a vast order of plants known from fossils as far back as the Devonian period and of great importance in the Carboniferous period (which includes the Coal Measures) but now represented only by the Cycads and Conifers. The derivation of the flowering plants from this group is however one of the most difficult questions before botanists. It has been attacked from two aspects: the morphological and the serological. The first method seeks to explain the parts of the flower in terms of the bracts and fertile leaves of the cone, thus in a male flower the bracts have become calyx, the bilocular anthers fused in pairs to become quadricocular stamens and some stamens transformed to petaloid stamens and later to petals. The serological method is based on the hypothesis that the expressed sap of related plants should give the same reaction when injected into the blood vessels of animals. This method has been used with great success to determine relations among bacteria, but the technique is not yet perfected to give

conclusive results with higher plants.

**Angkor** ruined town in the forests of Cambodia. French Indo-China relic of Khmer civilisation (9th cent. A.D.). Angkor Wat 1 m. S. is a Khmer temple in three stages surmounted by a pyramidal central tower.

**Angler Fish**, sometimes called fishing frog, sea devil and gab, is a large marine fish 4 or 5 ft long found on British coasts. It has a large flat head and a huge mouth with long backwardly curving teeth. In colour it matches the sea bottom where it lurk waiting for prey which consists mostly of smaller fishes. These it entices within reach by waving a long filament on its head to simulate a wriggling worm.

**Angles** a Teutonic tribe which used to inhabit what is now Schleswig. They migrated to Britain in the 6th cent. A.D. and settled in the L. particularly East Anglia.

**Anglesey** (1 gl sea) county N. Wales, an island separated from Carnarvonshire by the Menai Straits. Its surface is a plateau of much denuded and very ancient rocks. Agriculture and quarrying (mainly slate) are carried on; asbestos and me coal and copper are found. Anglesey is connected with mainland by Stephenson's tubular railway bridge (built 1850) and Telford's suspension bridge (finished 1876). Holyhead the packet station for Ireland is situated on a fine harbour built by the L. & N.W. Railway (L.N.W.). Under the name of Mona Anglesey was known to the Romans as the headquarters of the Druids and was conquered by Agricola, A.D. 78. Later it was conquered by the Angles, whence its name. Anglesey Island, the granary of N. Wales, Anglesey defied the Normans for 10 years but was finally conquered by Edward I who built a castle at Beaumaris, now the county town. Area 266 sq m. pop. 49,000.

**Anglican Church**, see CHURCH OF ENGLAND.

**Angling** the art of catching fish with rod and line and baited hook, is among the

most ancient of human activities "Gorges," the straight or slightly-carved pieces of stone from which the fish-hook evolved, are frequently found among Neolithic flint implements. The Ancient Egyptians fished for sport, as is shown by wall-paintings of high officials with rod and line. In the *Odyssey* of Homer, the monster Scylla, which picked men from the deck of Odysseus' ship, is compared to an angler pulling up fish. The earliest complete treatise on angling, the *Haliectica* of Oppian, was written in Greek in A.D. 160. The earliest reference to fly-fishing is in Aelian's *Natural History* (3rd cent. A.D.). Fishing is mentioned in the *Colloquies* of Ælfric, Archbishop of Canterbury, in the 10th cent., but the earliest English work on this subject is *A treatyse of fysshing with an angle*, printed by Wynkyn de Worde in 1496. Modern literature of the sport began in the 17th cent. with *Secrets of Angling*, by John Denny (1613), followed in 1653 by Izaak Walton's classic, *The Compleat Angler*.

*Freshwater fishing* may be divided into 3 classes: fishing on the surface (*fly-fishing*), fishing in mid-water (*spinning* and *trotting*), and bottom fishing.

For *fly-fishing* either artificial or natural flies may be used, the artificial flies being "wet" or "dry." The "wet," or "sunk," fly floats just below the surface, the "dry" fly rests on the water. Fishing with the natural insect is known as *dapping*.

In *spinning* a small live fish may be used as bait, or an imitation drawn through the water, revolving to suggest a small fish in difficulties. *Trotting* is a similar method, in which a small dead fish or artificial bait is made to dart up and down in the water without revolving.

In *bottom fishing* a bait, consisting of worms or paste, is allowed to rest near the bottom, with a "float," of cork or quill, showing just above the surface of the water, dipping under at a "bite." Bites can also be recognised by feel alone (*hand-fishing*).

**Salmon Fishing** The salmon (*Salmo salar*) is the most highly esteemed of fresh-water fish. A good specimen weighs from 10 to 30 lb., but occasionally may exceed this weight considerably. Salmon are generally taken with special *salmon flies*, bunches of bright feathers of various colours and sizes, which do not imitate any real insect. Large flies are usually best for spring fishing when the water is high; small for low water in summer; and small or medium for autumn. Salmon are at their best when "clean-run," i.e. having just ascended the rivers from the sea, in spring, though they are heavier and more numerous in autumn. The best time for salmon-fishing is after heavy rain at the end of a drought when the fish are on the move.

*Salmon rods* may be of greenheart or split cane, usually with a steel core. Rods of 20 ft. or more in length were formerly used, but a shorter rod (16 to 17½ ft.) with a heavier line is now generally preferred, allowing a longer cast of up to 90 ft. with less effort. American rods are even shorter, averaging from 12½ to 15½ ft. The *cast* may be made from a boat or the bank or when wading in the stream itself. The fly should be cast across and down stream, and allowed to float naturally head to stream. In *harling*, a less artistic method used on large rivers, the fly is trailed behind a boat rowed back and forth, while drifting slowly downstream.

*Lake salmon* are caught from boats which are allowed to drift slowly while casts are made diagonally over spots where salmon are likely to be lying.

Salmon may be caught by *spinning* when the water is too high or too coloured for fly. They will also take prawns, shrimps or worms on or near the bottom. Here a shorter, stiffer rod is required. The best salmon fishing outside Great Britain is in Norway, Iceland, Canada, and Newfoundland.

**Trout fishing** Brown trout (*Salmo fario*), and rainbow trout (*Salmo irideus*), an importation from America

# ANGLING



salmon fly

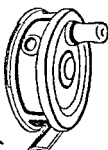
dry trout fly



fly spoon

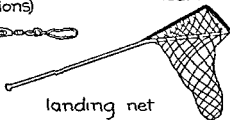


fly minnow

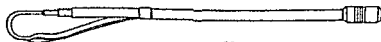


trout reel

trout fly rod (sections)

swivelled saddle  
lead

landing net



trout gaff



may be taken with "wet" or "dry" fly or by dapping. The cast is usually made upstream, as advocated by W C Stewart in *The Practical Angler* (1857). A 10-ft rod is generally used for streams and a longer rod, 12 to 13 ft, for lake fishing from a boat. Trout vary in size, from the great cannibal trout of the Thames and the Scottish lakes, which occasionally weigh 20 lb, to the small moorland-stream trout, weighing only a few ounces.

**Spinning.** There are many artificial spinning-baits for trout available. The best live bait for the great lake trout is a small trout, for large river trout, a gudgeon, and for smaller trout, a minnow. Trout may also be taken with the *worm*, but worming in thick water is not regarded as sporting. Clear-water worming, however, when the worm is cast upstream like a fly, requires much skill.

**Sea-trout** (*Salmo trutta*) are found in most salmon rivers, as well as in the Scottish and Irish lakes. They may be taken with a small salmon fly, but a better method is to use small trout flies ("wet"), and a single-handed rod of 10 to 12 ft. Sea-trout, occasionally taken with dry fly or by spinning, are best from July to September.

**Grayling** (*Thymallus vulgaris*) rise well in winter to small trout flies, either "wet" or "dry," or may be taken with a "grasshopper," a leaded hook with coloured wool twisted round the shank and tipped with maggots. Grayling occasionally weigh 4 lb.

**Char** (*Salvelinus alpinus*), found chiefly in Cumberland and Westmorland, may be taken with a small fly or artificial spinning bait. They seldom exceed 1½ lb.

The **Pike** (*Esox lucius*), highly esteemed for its fighting qualities, sometimes weighs up to 30 lb or more. Pike are at their best in December. Being purely predatory fish, they are generally taken with small live fish or with artificial spinning bait. **Perch** (*Perca fluviatilis*) are easily

caught with worm, small fish, or small bright artificial spinning bait, and will occasionally rise to the fly in shallow pools. Average weight, 1 to 2 lb.

The **Carp family** (*Cyprinidae*) are mainly bottom feeders, but some kinds will also rise to the fly. *Carp*, *tench*, *barbel*, and *bream* are bottom feeders only. *Carp*, which sometimes grow to 20 lb, feed freely only in summer and in the early morning. *Barbel*, which are found only in rivers, notably the Thames and the Trent, run to 1½ lb in weight, *bream* to 8 lb, and *tench* to 5 lb. Worms, grubs, or paste form the best bait in each case. "Ground-baiting" is necessary, i.e. food must be put down beforehand to attract the fish.

**Roach**, **dace**, **rudd**, and **chub** will rise to the fly as well as take bottom bait. Roach will rise only in very hot weather, but the others rise all the summer. They will take bottom bait during the winter. "Palmer's," large bushy lures intended to represent caterpillars, may be used for chub, which sometimes reach 5 lb, the others averaging between 1 and 2 lb. **Mahseer** (*Barbus mosal*), the Indian carp, grows to a very large size, frequently 60 lb or more. The method of fishing is the same as for salmon. Large mahseer take spinning bait better than flies. **Eels** (*Anguilla vulgaris*) are best taken at night or in wet weather, with worms or small fish. They sometimes weigh 8 lb.

**Sea-fishing.** The general methods are much the same as for fresh-water fishing, but as fly-fishing is seldom practicable, spinning is more often employed, and bottom fishing requires shorter, stouter rods, and stronger tackle. The principal British salt-water fish are the **Bass** (*Labrax lupus*), a splendid fighter which occasionally reaches 15 lb. They are best taken with small fish from a boat or the rocks. Small bass are sometimes caught with a large fly. **Pollack** (*Gadus pollachius*), which grow to 20 lb or more, are best taken from a boat.

## Anglo

907

## Angola

with spinning bait a live or artificial sand-eel *Grey Sallet* (*Mugil capsi*) frequent harbours and tidal pools. They are strong fighters and may be taken with ragworm or a vegetable bait. They run to about 8 lb. *Cod* (*Gadus morhua*) may be taken with bottom bait from a boat. They sometimes exceed 90 lb but are poor fighters. *Mackerel* (*Scomber scomber*) are game fighters run to about 2 lb and are best caught by trailing a piece of fish-skin behind a boat. *Whiting* and *Whiting poit* (*Cad's merluccius* and *C. denticus*) bottom feeders will take a paternoster 3 or 4 hooks at intervals above a lead which may also be used for flat fish—flounder plaice and dab. *Conger*. This large and powerful eel is a night feeder usually caught on or near the bottom from a boat with flesh bait. Very strong tackle is required. *Smelts* may be caught on very small hooks baited with pieces of ragworm shrimp etc.

*Big game fishes* are found chiefly in tropical and semi-tropical waters as off the coasts of Florida and New Zealand. They include black sea bass (up to 400 lb) and tarpon. The tunny or tuna largest of the mackerel family has recently been found in large numbers in the North Sea round the Dogger Bank feeding grounds. In the summer of 1933 many English ports men—and women—made good catches. The record tunny was caught by Colonel Peel. It weighed 98 lb. Another big fish scaling 793 lb was booked by David Leigh aged 1 who required help to land it. On p. 175 reported 40 tunny round their launch. Tunny up to 1500 lb have been captured off California and near Tahiti. They are found in the Mediterranean for their fish. Marlin sharks and sword fish are the large fish which can be taken with rod and line. Fishermen off New Zealand have caught swordfish of over 1000 lb. Fish bait is used trailed in mid water behind a boat.

**Anglo-Israelite Theory** a theory held by a number of people in England that the Jews are descended from one

or more of the 10 tribes of Israel that never returned from the Babylonian captivity. The theory claims that the tribes moved N.E. from Babylon and under the name of Saxons invaded these shores.

**Anglo-Norman Literature** Norman French the language of the Normans conquerors of England was with Latin the literary language of England up to the 14th century particularly from c. 1100 to 1155. Many of the French romances fabliau and fabliaux were first known in England in this form of French and many valuable historical works were written in it. See *J. Visiting Anglo-Norman Language and Literature* (1923).

**Anglo-Saxon**, the name given to the oldest form of the English language as spoken from the time of the Saxon conquest of Britain up to about 1150 more correctly Old English. It is a Low German member of the West Germanic group (see Table IV.10. EUROPEAN LANGUAGES). See also ENGLISH LANGUAGE and ENGLISH LITERATURE EARLY.

**Anglo-Saxon Chronicles**, more commonly known as The Anglo-Saxon Chronicle are contemporary records of outstanding events written in Old English and dating from the 9th century. The Chronicle was probably begun under Alfred the Great. Its continuity and its value are alike variable. Over certain periods it gives a fairly full record but there are also fragmentary periods. These latter containing certain poems. *The Iste of Brunanburh* for example. There are no entries after the year 1154. With all its deficiencies it is of inestimable value in the annals of English history.

**Angola**, Portuguese colony in W. Africa situated between the Belgian Congo on the N. British S. Africa (Damaraland) on the S. and N. Rhodesia with the Belgian Congo on the E. A small Portuguese enclave (Kalandia) between the French and Belgian Congo N. of the mouth of the R. Congo is included in Angola.

The coastline embraces the Bight of

Benguela, and is over 1000 m long. The chief river is the Kwanza, or Coanza. The climate on the plateau is cool and healthy, but the coast-plain is malarious. Area, 486 100 sq m.

Coffee, coco-nuts, sugar, vegetable oils, and cotton are produced, ivory, cattle, fish, wax, and maize are exported. Chief minerals are copper, iron, malachite, petroleum, and salt, diamonds are known to exist in small



Angola Native Musician

quantities. Petroleum and asphalt are worked.

**Population** The inhabitants are predominantly Bantu negroes. There are c 40,000 whites. Chief towns San Paulo de Loanda (capital), Benguela, Mossamedes, and Malange. Huambo (New Lisbon) is destined to be the future capital. Pop (1931) 4,182,000.

**Angora** (now *Ankara*) (1) capital of the Republic of Turkey since 1924, and chief town of the vilayet of Angora. Mohair, fruit and honey. Rail connection to Constantinople (Istanbul) c 220 m to E. The town is the ancient Ancyra, and has Byzantine and Roman antiquities. In 1402 the Tatars under Timur here

defeated the Turks under Bayazid I, who was captured, in a battle in which 3 million men are said to have taken part. (2) Vilayet in N Central Anatolia, agricultural district, staple product, Angora wool (hair of Angora goat). Pop, town 74,600, vilayet 404,700.

**Angoulême** [AHN-GOO-LÂM'], town, W France, on R Charente, capital of the department of Charente. Cognac, wine, and paper mills, Romanesque cathedral. The county of Angoulême was an important fief held at one time by William Taillefer and later by the Lusignan family. Pop c 32,000.

**Angoulême, Louis Antoine de Bourbon, Duc d'** (1775-1844), son of Charles X, and dauphin of France, left his country in the year of the Revolution (1789), and returned in 1814 to be Lieutenant-General under the restored Louis XVIII. He retired to Austria during the 1830 Revolution, and died at Goritz.

**Ångström, Anders Jonas** (1814-1874), Swedish physicist, famous for experiments in heat and spectroscopy, was observer at the Upsala Observatory from 1843, Professor of Physics at Upsala University from 1858, and secretary to the Royal Society of Sciences at Upsala.

**Angus, Scottish county**, formerly called Forfarshire, situated on E. coast, with Aberdeenshire and Kincardineshire on N, Perthshire on W, and the estuary of the Tay on S. Angus is hilly in SW (continuation of Sidlaw Hills) and mountainous in N (Grampian Mountains, Glas Maol 3500 ft). The E extremities of the two very fertile districts of the Carse of Gowrie and Strathmore are continued into Angus. The coast is lowland. Chief river, the South Esk (48 m), draining the Grampians, and flowing to the North Sea near Montrose. Area, 874 sq m. Angus is a fertile agricultural district, growing barley, oats, and fruit. Cattle- and sheep-raising are important. Staple manufactures, centred about Dundee.

# Anhalt 209 Animal

(qv) on R Tay include jute flax and preserves Chief towns Forfar (county town) Dundee Arbroath Montrose Pop 970 00

The district of Angus was known to the Romans (who have left many indications of their presence) as a Pictish settlement The battle of Mons Graupius is believed to have been fought in the N of the county In the Middle Ages the hereditary Earls of Angus were among the powerful feudatories who disturbed the authority of the Scottish crown In 1389 the earldom was conferred by royal patent on George Douglas and remained in that family for three centuries It is now merged in the dukedom of Hamilton

Anhalt [AN HALT] free state of of the German Republic since 1919 formerly a duchy The territories of Anhalt are not a geographical unit but sundered and almost surrounded by portions of Prussian Saxony E Anhalt is sandy fertile in places but heavily forested W Anhalt is fertile lowland in N rich in minerals mountainous in S wheat sugar beet fruit flax and tobacco Ignite and salt are produced Industries sugar refining brewing distilling Chief towns Dessau (capital) Bernburg and Zerbst Area 890 sq m pop 351 000

Anhui, province of China proper on the Yangtze Huang area 545 6 sq m est pop 20 199 000 The capital is Anking In the N wheat millet and beans are grown The S portion with its genial climate is a combination of mountain and valley with patches of rice and tea cultivation Hwei-chow is an important tea centre

Anhydride [AN HI DRID] strictly a substance which has been deprived of water and which, on the addition of water will be reconstituted into the original substance The term is more usually applied to oxides which on the addition of water form an acid such for instance as sulphur trioxide or sulphuric anhydride which on the

addition of water becomes sulphuric acid according to the following reaction



There are numerous other such cases in inorganic chemistry e.g. phosphoric anhydride sulphurous anhydride etc

In organic chemistry acid anhydrides are substances corresponding to the acid less water they are obtained by the action of the acid chloride (qv) on the sodium salt of the corresponding acid The acid anhydrides are compounds of unpleasant smell and of considerable chemical activity although this is less than that of the corresponding acid chloride The most important member from the practical point of view is acetic anhydride ( $\text{CH}_3\text{CO}$ )<sub>2</sub>O

Amiceus Iope from c 157 to 168

Aniline (pale slaty or aminebenzene) is when pure a colourless oily liquid with boiling point 184 C It freezes at - 6 C On exposure to air aniline rapidly acquires a brown colour and the colourless compound is rarely met with It is obtained by the reduction of nitrobenzene (qv) by iron filings and hydrochloric acid

It is the starting point for the manufacture of a large number of dye intermediates and is also employed in perfumery and as a constituent of certain rubber vulcanisation accelerators

Aniline forms salts with acids the hydrochloride is the most common and is known technically as *aniline salt*

The chemical formula of aniline is  $\text{C}_6\text{H}_5\text{NH}_2$

Aniline Salt, see ANILINE

Animal, living organism which is not a plant The principal differences between typical plants and animals are so many that no confusion between the two is likely The fundamental distinction however is physiological rather than structural Plants can make their tissues from inorganic matter usually derived from the soil and from the atmosphere under the influence of sunlight Animals have not that power and are therefore

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that they rest only when the greater area of their body is in contact with the ground. When two opposing forces are influencing the animal it takes up a position that is the resultant of them.

Environment can influence tropism. Many small fishes exhibit no phototaxis until confined in a small jar when they are impelled to swim towards the light. Tropisms however are not purely automatic movements. The organisms do not turn in the simple manner of a wind vane. Tropisms are variable and depend on the creature's central nervous system. An increase in temperature may cause negative and a decrease positive phototaxis.

2. *Reflexes* are mechanical movements dependent upon the interaction of the nervous system. The structural basis of every reflex consists of a receptor organ that transmits the excitation due to stimulus inward and an effector organ that responds either by glandular or muscular action. The sum of impulses passing through the nerves involved is a *simple reflex arc*.

More often than not a reflex arc is *compound*, associated nerves being called into activity. The vast majority of animal movements consist of compound reflexes. The functioning of internal organs is almost exclusively reflex. In man the pupillary reflex is easily observable. A sudden strong light causes the pupil of the eye to contract. Withdrawal of the stimulus allows it to expand again. Failure of reflexes is indicative of a neuropathic condition. Sea urchins despite all the complicated movements of their numerous organs which seem to demand experience and memory are considered purely reflex creatures. Starfish are able to perform complicated and apparently intelligent movements free themselves from difficult positions and right themselves when turned on their back but nevertheless the amputated limb of a starfish exhibits all the contortions of a whole starfish provided that the

nervous reflex paths are not damaged.

Hermit crabs protect their soft parts in the abandoned shells of other sea creatures. Their behaviour when they chance upon an empty shell seems highly purposeful and intelligent. First they investigate the interior with their claws then they turn the shell round so that any small stones or other foreign bodies may fall out and only after such careful manipulations do they venture into their new abode. Under natural surroundings hermit crabs do not come upon available shells very often but in an aquarium under experimental conditions they change their habitation continually under the stimulus of numerous available shells and discard a large comfortable fortification in favour of a small uncomfortable one simply because they have come upon the latter after the former. They also go through the searching and emptying performance with an artificial shell that has no opening and strive to press their bodies into it. Not only sea creatures but numerous land animals exhibit this form of entirely reflex existence. For instance such animals as frogs and chameleons would starve to death in a world of plenty if that plenty remained motionless. A boxful of edible dead flies fails to elicit the snap reflex from a frog not because of any inherent objection to the consumption of carrion for a dead fly or even a small stone moved by mechanical means before the frog acts as a stimulus to its feeding reflex.

3. *Instincts* are responses composed of numerous movements shown by all normal members of a species. An animal does not *learn* its instincts but inherits them from its ancestors just as it inherits its morphological characteristics. Instinctive behaviour seems purposeful and intelligent but careful analysis reveals that it is composed of a chain of reflexes each the cause of the next thus animals disturbed during the performance of instinctive reactions are generally unable to continue but must begin again and if the initiatory stimulus is absent they

dependent for subsistence upon plants. Hence, as was once said, a world inhabited by animals alone is inconceivable.

Also, it is evident that plants must have preceded animals in the evolution of living things, and that the first animals must have fed upon plants. There are, however, some lowly organised forms which combine the attributes of plants and animals, and it is

not possible to state with certainty to which of the two kingdoms they belong.

**Animal Charcoal**, see CARBON, BONE PRODUCTS

**Animal Extracts**, see MEAT

**Animal Psychology** It being impossible to learn from the lips of an animal whether or no it is introspective, we are reduced to viewing its behaviour only, but such behaviour often leads to the conclusion that animals are motivated by forces very closely akin to those that dictate the behaviour of human beings. Animal psychology attempts to arrive at the cause of behaviour, not only in natural surroundings, but under experimental conditions.

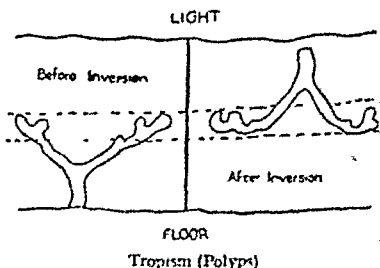
Animal behaviour may be broadly divided into four types of reactions

1. Tropisms or taxis
2. Reflex actions
3. Instinctive reactions
4. Intelligent actions

1. *Tropisms* are exhibited by the more humble species, and consist in turning movements either to or from the stimuli, a movement of the former kind being a positive, and one of the latter a negative, tropism. If the organism moves its entire body in the positive or negative direction the movement is said to be a taxis. Tropisms are named according to the type of stimulus that causes them, as set forth in the following list

Stimulus	Tropism
Pressure	Thigmo-tropism or taxis
Contact with solid	Stereo-tropism or taxis
Gravity	Geo-tropism or taxis
Temperature	Thermo-tropism or taxis
Chemical substance	Chemo-tropism or taxis
Light	Photo-tropism or taxis
Sunshine	Helio-tropism or taxis
Food	Tropho-tropism or taxis

Organisms attached to the bottom of the sea (sessile) can only perform tropisms. If a polyp, a sea organism that normally grows upward, is suspended in an inverted position it will continue to grow upward, that is, in relation to its root, *downwards*, because of an inherent negative geo- and positive photo-tropism.



Worms and some small mammals exhibit a positive stereo-tropism, in

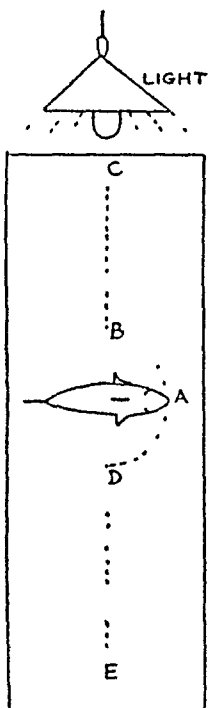


Diagram illustrating Tropisms and Taxis  
Pivotal movement from A to B = Positive Phototropism. Forward movement from A to C = Positive Phototaxis. Pivotal movement from A to D = Negative Phototropism. Forward movement from A to E = Negative Phototaxis.

ence and are not helped by being shown how to manipulate the lever latch or bolt but when one animal has become expert in engineering an escape a companion animal learns rapidly by imitation.

4 *Intelligence* demands an insight into the connection of things and events and such insight is proved to be lacking in most animals except anthropoid apes. At the experimental station at Tenerife Dr. Kohler made observations on apes kept under conditions as natural as possible and in a climate similar to their native haunts. The problem presented to the animals was usually how to obtain food placed beyond their reach. A banana tied to the end of a string presents no difficulty to an ape. It simply pulls the string and gets the banana. A carnivorous animal would starve to death before it would pull a string attached to a piece of meat. Although dogs have been trained to get food by pulling a string at a word of command dogs so trained would not exert the faculty of their own accord when hungry. The string pulling of the dog is not an intelligent act but a conditioned reflex. Fruit placed out of reach and with no string attached was soon drawn in by the apes who used a stick a piece of wire or even a stone to this end. By the employment of such an intermediary piece of material the ape proves that it is capable of using tools.

No other animal can do so unless trained and when trained will not do so without the word of command. A bunch of bananas hanging from the roof of the cage caused the apes to fetch packing-cases pile them up and climb upon them also to stand a bamboo rod upright without support climb rapidly and seize the fruit before jumping clear of the falling rod. Sticks were used for all purposes as levers as digging tools and even as missiles but it must be emphasised that these uses were not tricks learnt from man but spontaneous application engendered by the animal's own intelligence. The apes had no

difficulty in finding their way round behind a wire screen placed between them and their food but dogs often and poultry always fail in this test. The attraction to the food is so strong that they fail to use their memory though they may know the way round the partition.

The problem of removing an obstacle was not so easily solved the apes preferring to move themselves in relation to the obstacle. Not all the apes under observation showed the same sagacity only two succeeded in pushing food away as a preliminary to pulling it in when obstacles were erected to make both movements necessary and only one thought of extending a short thick bamboo rod by pushing a thinner one down the centre. This veritable genius put to a special test actually joined three rods by inserting a thin one between two thick ones. Each time he held one rod rigid in his left hand and inserted the extension with his right. Irrespective of personal capabilities all the apes joined the anti-fishing school. It so happened that a wooden beam just beyond their enclosure had become an ant-run and the apes enjoying the flavour of the formic acid contained in the insects found out how to extend pieces of straw and thin sticks up to the beam until the ants on their journey had taken the wrong turning then rapidly withdraw the sticks and lick off the ants. At times all the monkeys in the enclosure would sit side by side with sticks extended just like a row of human anglers along a stream.

Lower types of monkeys were also experimented with but proved inferior for though they used tools they were unable to perform any useful movements away from their own bodies. They could pull a bolt undone but not push it.

The anthropoid apes therefore are the only animals gifted with intelligence and stand definitely on a plane between man and the lower creatures. See C. Lloyd Morgan *Animal Be-*



cannot begin again at all. The development of instinct may be classed with the functional mechanisms of the animals and is subject to the same laws of selection. The instincts are subdivided thus: nutrition; migration, cleansing, protection, defence, pairing, metamorphosis, egg-laying, care of young, nest-building, social life.

Charles Darwin paid much attention to the instinctive behaviour of earth-worms in dragging leaves, pine-needles, and the like down into their tunnels to serve as food. These humble creatures seem to have a remarkable knowledge of mechanics. Broad-based leaves, such as those of the lime, they seize by the point, with the result that not only do they drag along the ground in a balanced manner, without pivoting round, but on arriving at the worm-tunnel they enter point foremost and consequently roll up in the descent. Pine-needles that are composed of two limbs joined in a V formation the worm takes by the joint. It has recently been shown that the worm does not choose the proper end of leaves and pine-needles for mechanical reasons, but because the opposite ends of these leaves are of a different chemical constitution, and the reaction involved between the leaf matter and the worm's digestive matter decides the question, just as hydrogen introduced into a mixture of oxygen and nitrogen will, under correct conditions, combine with the former and ignore the latter. Chemical affinity is not intelligence.

Bees and wasps, living under such interesting social conditions, seem almost as intelligent as human beings, yet a worker bee isolated from birth so that it could not learn the social organisation of the hive will ultimately, if allowed to get the necessary materials, occupy itself in the same manner as all other worker bees.

Reasonless as instinct is, it is not entirely inflexible. Although the different species of birds all build the same type of nest, each individual bird

varies its construction to suit both the materials at its disposal and the position it is about to occupy. Higher animals thus modify their instincts by their experience, and to this end memory and association are employed. Every reaction to stimulus leaves a trace behind. Frequent repetition of the stimulus, at intervals of time too long to allow the animal to become accustomed to it, will ultimately result in habit-formation.

*Association* is the principle underlying the conditioned reflex (*qv*). A connection is formed between the primary and secondary stimulus, so that the behaviour applicable to the primary is performed on reception of the secondary stimulus only. If a earth-worm is placed in the tail of a Y-shaped glass tube, in advancing towards the bifurcation it can choose to pass through either the left or the right limb. If two electrodes are fixed in the left limb so that it receives an unpleasant stimulus upon entering, it will in time become trained to enter the right limb only, and it can be so trained even when the main portion of its nervous system has been removed.

To test memory, many experiments have been conducted by confining animals in problem boxes with partition and false and true exits. The animal is free to choose either side of the partition, and after it has learned to pass down the side on which the true exit is situated the experiment is stopped for a time. When the experiment is resumed it is found that the animal remembers which way to go. The memory faculty varies between species and in individual members of a species. Monkeys, dogs, cats, rats and reptiles have all been used in problem boxes of more or less complicated construction, in which latches, levers, bolts, and wire catches must be worked in order to effect an exit. The animal's endeavours, at first aimless, gradually become apparently purposeful, in that it learns to dispense with useless movements. The animals must gain their own exper-

## Ankara

Anjou was definitely incorporated in the royal domain

**Ankara**, see **ANCORA**

**Ankylosis**, see **JOINTS**

**Anna**, an Indian coin, the sixteenth part of a rupee equivalent at par to £ 1d and divided into 12 pice

**Anna Comnena** (1083-1149) Byzantine historian and daughter of Alexius I she schemed for the throne after her father's death and during the rule of his son lost her possession when her plans were discovered and retired to a convent in Greece where she wrote a history of her father's life Anna Comnena was a student of science literature and philosophy

**Annals**, historical records in which the treatment is strictly chronological the material being arranged year by year

**Annam**, French protectorate in S.E. Asia on the E coast of Indo China bounded on the N by Tongking on the W by Laos and Cambodia on the S.W. by Cochinchina and on the E by S. China Sea.

**Relief** The coastline is low and even except in the extreme S. principal inlet Bay of Tourane. The interior is traversed by a mountain axis roughly parallel to the coast a S.E. articulation from the Laos Highlands. The mountain core is granite with flanking edimentary rocks in various stages of denudation (Pu Atwat 8200 ft). Rivers are short and impeded by cataracts. Area 39,600 sq. m.

**Climate and vegetation** The S.W. monsoon blows overland but produces little rainfall. The N.E. monsoon brings heavy autumn rain. The mean temperature is fairly high (over 70° F.) and vegetation on the coast lowlands is prolific. The highlands are well forested (teak, etc). Typhoons are very common.

**Production and Commerce** Annam produces rice cereals (maize) are a nut tropical drugs and spices mulberry raw silk cotton and tobacco cattle are fairly important. Minerals are gold iron (hematite) zinc copper salt there are coal mines near

-1

## Annates

**Tourane** Mining is carried out by natives. Agriculture is backward but improving extensive irrigation works are supplied by the Phanrang River. Principal exports are cotton and ilk cinnamon paper tea in ports upon cotton manufactured cottons petroleum and tobacco.

**Population and Government** The coastal regions are inhabited by native Annamites the highlands by tribes of Monts. There are considerable Chinese element and about 3,000 Europeans. The Government is carried on by a native dynasty (present ruler King Lu-Dai) assisted by a council and elected assembly under the surveillance of a French *résident supérieur*. The system of education is good and provision is made for about 50,000 children. French troops garrison Hué and France controls the customs of Tourane and Qui-Nhôn. Chief towns Hué capital (31,000) and Tourane Pop. (193) 51,000.

**History** Annam was for a considerable period under Chinese control although the civilisation of the early occupants of the country was Hindu. In 1787 a native rebel Gia Long concluded a treaty with Louis XVI and in 1801 he conquered all Indo China with French assistance. The French protectorate was finally established and a treaty ratified in 1888.

**Annan**, royal burgh Dumfriesshire situated on R. Annan near egress to Solway Firth. Quarrying tanning distilling and fisheries. Roman antiquities. Pop. 3,500.

**Annapolis** [ANAPOLIS] port and capital of State of Maryland U.S.A. on Severn R. near Chesapeake Bay. Site of U.S. Naval Academy. Pop. 12,500.

**Annapolis Royal**, former capital of Nova Scotia on Bay of Fundy. Centre of rich fruit growing country exports apples. The town was an old French settlement captured by Britain in the War of the Spanish Succession and ceded to her in 1713. Renamed after Queen Anne. Pop. 2,900.

**Annates**, the first year's income of a

*haviour*, W Kohler, *The Mentality of Apes*, H S Jennings, *Behaviour of Lower Organisms*

**Animal Training**, see ANIMAL PSYCHOLOGY

**Animal Trials**, see WITCHCRAFT

**Animal Worship**, see RELIGION (PRIMITIVE)

**Animals, Cruelty to.** A century ago, "an animal had no rights." Bear-baiting, cock-fighting, all kinds of cruelty were perfectly legal. In 1822, owing directly to Jeremy Bentham, the first measure restraining cruelty to cattle was passed in Great Britain. In 1833 bear-baiting and cock-fighting were prohibited within 5 m of Temple Bar, because such sports collected crowds of noisy and riotous persons and therefore interfered with respectable citizens. Since then, many statutes have been passed, and are consolidated in the Protection of Animals Acts, 1911-1921. Any person who ill-treats an animal, or causes it to be ill-treated, or keeps any premises for that purpose, or performs or countenances any operation upon an animal without due humanity, is guilty of cruelty, punishable by a fine not exceeding £25, or 3 months' imprisonment with or without hard labour. On conviction, the Court may make any order as to the disposal of the animal that it thinks fit. Dogs may not be used as draught animals, but hunting or coursing for sport, and slaughter for human food, are not within the Acts if there is no unnecessary cruelty (see GAME LAWS). Wild birds are specially protected by the Wild Birds Protection Acts, 1880-1908, the main effect of which is to establish a close season for all wild birds from March 2 to July 31. Penalties are laid down in respect of any wild bird shot or trapped between those dates, or offered for sale by, or in the possession of, any person, after March 15. The penalties are heavier in the case of certain birds, but there is an exemption in favour of the occupier of land who takes on his land any wild bird not mentioned in the schedule. The Home Secretary may, on the application of a

county or borough council, make any order with regard to the application, variation, or extension of these Acts. As there have been many orders of local application, any person interested should obtain a copy of the order in force from the clerk of the particular council. It is an offence to place traps calculated to cause bodily injury to wild birds or to attempt to take a wild bird by means of a hook or similar instrument. The Acts do not apply to birds or their eggs imported from abroad during the close season here, but it is an offence to import the plumage of any except certain specified birds, of birds imported alive, and of birds ordinarily used for human consumption. The prohibition does not apply to plumage imported as part of the wearing apparel of a passenger if intended in good faith and reasonably required for her personal use. See also R S P C A

**Animism**, see RELIGION, PRIMITIVE.

**Anion**, the name given to those ions in a solution of an electrolyte which are negatively charged, and which, therefore, when a current is passed through the solution, appear at the anode or positive electrode (see ELECTROCHEMISTRY).

**Anise**, a half-hardy annual used for garnishing or seasoning. Sow during April in pots plunged in a hot bed, remove to a light, warm border in May. Thin the plants to 6 in apart. The seed is ripe in Aug or Sept. It does not bear transplanting (see HERBS).

**Anjou**, county and later duchy of N W France under the *ancien régime*; after the Revolution, broken up into several departments, of which Maine-et-Loire is the most considerable. Chief city, Angers. Fulk the Red (A D 898) was the ancestor of a line of counts, who became prominent French feudatories. In 1154, Anjou became part of the Plantagenet possessions of Henry II of England. Recovered by the French crown 1214, it became a royal appanage 1246. Erected into a duchy in 1300, it passed to the Neapolitan Valois line. In 1581

Anjou was definitely incorporated in the royal domain

Ankara, see ANCORA

Ankylosis, see JOINTS

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Relief The coastline is low and even except in the extreme S principal inlet Bay of Tourane The interior is traversed by a mountain axis roughly parallel to the coast a S E articulation from the Laos Highlands The mountain core is granite with flanking sedimentary rocks in various stages of denudation (Pu Atwat 8000 ft) Rivers are short and impeded by cataracts Area 39 760 sq m

Climate and Vegetation The S W monsoon blows overland but produces little rainfall The N E monsoon brings heavy autumn rain The mean temperature is fairly high (over 60° F) and vegetation on the coast lowlands is profuse The highlands are well forested (teak etc) Typhoons are very common.

Production and Commerce Annam produces rice cereals (maize) arecanut tropical drugs and spices mulberry raw silk cotton and tobacco cattle are fairly important Minerals are gold iron (hematite) zinc copper salt there are coal mines near

Tourane Mining is carried out by natives Agriculture is backward but improving extensive irrigation works are supplied by the Phanrang River Principal exports are cotton and silk cinnamon paper tea imports spun cotton manufactured cottons petroleum and tobacco

Population and Government The coastal region are inhabited by native Annamites the highlands by tribes of Moïs There is a considerable Chinese element and about 3 000 Europeans The Government is carried on by a native dynasty (present ruler King Bao Dai) assisted by a council and elected assembly under the surveillance of a French *résident supérieur* The system of education is good and provision is made for about 10 000 children French troops garrison Hué and France controls the customs of Tourane and Qui Nhon Chief towns Hué capital (31 000) and Tourane Pop (193 ) 5 100 000

History Annam was for a considerable period under Chinese control although the civilisation of the early occupants of the country was Hindu In 187 a native rebel Gia long concluded a treaty with Louis XVI and in 1801 he conquered all Indo-China with French assistance The French protectorate was finally established and a treaty ratified in 1886

Annan, royal burgh Dumfriesshire situated on R Annan near egress to Solway Firth Quarrying tanning distilling and fisheries Roman antiquities Pop c 3000

Annapolis [ANN AP-OLIS] port and capital of State of Maryland U S A on S e R near Chesapeake Bay Site of U S Naval Academy Pop 12 500

Annapolis Royal, former capital of Nova Scotia on Bay of Fundy Centre of rich fruit growing country exports apples The town was an old French settlement captured by Britain in the War of the Spanish Succession and ceded to her in 1713 Renamed after Queen Anne Pop c 900

Annates, the first year's income of a

benefice, claimed by the Popes. In England assigned to the Crown in 1534, given back to the Pope 1555, resumed by the Crown under Elizabeth in 1559. Transferred in 1701 by Queen Anne to commissioners to be employed in supplementing the incomes of poor clergy, and together with "tithes" (*qv*) known as "Queen Anne's Bounty."

**Annatto** (*Arnatto, bixine*) is an orange dye obtained from the seeds of *Bixa orellana*, a small tree native to Central America. Its chief use is as a dye for butter and cheese, it is also used to some extent for dyeing textiles, but as it is not a fast dye its utility in this respect is limited.

**Anne** (1665-1714), Queen of Great Britain and Ireland, second daughter of James II by Anne Hyde. She spent her childhood in France, being brought up as a Protestant, in spite of her father's Roman Catholicism. During James' reign Anne was not prominent at Court. She had returned to England in 1670, and married Prince George of Denmark in 1683, refusing to renounce her religious faith on the chance of succeeding James, though still hoping to become Queen. She was friendly with Mrs. Churchill, wife of the future Duke of Marlborough, who in turn was the confidante of James' queen, and at the 1688 revolution, Anne welcomed William of Orange and his wife, her sister Mary. By the Declaration of Right (1689), the crown was to pass to Anne on the decease of both William and Mary and in default of any lawful issue to them.

Anne succeeded to the throne on William's death in 1702. Her reign marks the beginning of that development of Party Government which led to the secure establishment of parliamentary power over the monarchy. A Tory ministry was in power at the opening of the cent, and passed the Act of Union with Scotland in 1707, but the military successes of Marlborough, whom Anne created a duke, and dissension among the Tories, won confidence for the Whigs, who formed a ministry in 1708, only to fall at the end

of 1710, when Harley, Earl of Oxford formed a firm Tory administration which lasted beyond the end of his reign and concluded the War of Spanish Succession with the Treaty of Utrecht (1713). Oxford and Bolingbroke co-operated with the Queen with a view to obtaining the succession to the "Old Pretender," Anne's brother, but disagreement between the statesmen, and the Queen's illness, cut short their plans. After a reign of 12 years notable for political enmity, for the final disgrace of Marlborough; for sorrow at her inability to alter the Act of Settlement, and at the same time for the peaceful relation between crown and people and generous bequests to the Church—Anne died after a short illness on Aug. 1, 1717. She had borne 15 children, who all died in their early years.

**Annealing**, the process by which internal strain in bodies is relieved, heating them to a temperature at which their elastic properties almost cease to exist, and cooling them sufficiently slowly to prevent fresh strain being set up. Pure annealing is distinct from heat treatment causing chemical and molecular change, exemplified by glass, which, after blowing or casting and subsequent cooling, can be shown to be strained internally by examination with polarized light. The glass is heated in furnaces to a point just below that which it softens, and is then allowed to cool at a rate which depends upon its thickness. The extreme case, that of very large telescope objectives which are allowed to cool over a period of months in order to avoid reformation of internal strain, which would be fatal to their properties.

Annealing is commonly used to soften metals after plastic working. Thus in pressing shaped articles from sheet metal it is often necessary to perform the operation in stages annealing between each.

**Anne Boleyn** (c. 1507-1536), second wife of Henry VIII, and mother of Queen Elizabeth, was maid-of-honor

Henry's sister Mary and first attracted the king's attention at Court in 1540. Through the long divorce proceedings against Catherine of Aragon Henry maintained his interest in Anne and married her in 1553. But as infatuation passed Anne being frivolous and weak minded she was tried for adultery in 1556 by which she lost all her attraction for the King and vanished. She was executed in May 1556.

**Annulids** Worms in which the body is bilaterally symmetrical covered with a flexible cuticle and divided into a large number of mostly similar segments marked externally by circular grooves. Limbs when present are represented by unjointed outgrowths of the sides of the body.

In most annulids stiff bristles on the surface of the body aid movement especially in burrowing forms.

There is a distinct body cavity traversed from end to end by the alimentary canal with the nerve cord beneath it and by blood vessels often containing red blood. Each segment is typically provided with a pair of excretory organs and respiration is effected by the thin moist skin or by plume like gills. Annulids form the phylum or sub-kingdom *elida* and include such forms as the EARTHWORM, LEECH and LOBWORM (q.v.).

**Anne of Austria** (1601-1686) Queen of Louis XIII of France was the daughter of Philip II of Spain. Her married life was unhappy. On Louis XIII's death she acted as regent for Louis XIV being on intimate terms with her Minister Mazarin. Anne died in a convent where she had retired after Mazarin's death (1661).

**Anne of Brittany** (1478-1514) became Duchess of Brittany on the death of her father Francis II of Brittany in 1488 but on opposing the authority of Charles VIII of France she was defeated. Anne maintained the independence of Brittany by marrying the King and later was the wife of Louis XII who succeeded Charles VIII.

**Anne of Cleves** (1515-1557) daughter

of a German duke was the fourth wife of Henry VIII the marriage lasting five months in 1540. Her lack of beauty annoyed the King who annulled the marriage and granted her a pension.

**Anne of Denmark** (1574-1619) daughter of Frederick II of Denmark and Norway in 1589 she married James VI of Scotland afterwar's James I of England. Her marriage without dowry confirmed the Scottish claim to Orkney and Shetland which had been mortgaged by Christian I to James III.

**Anno Domini** (*Anno Domini*) Spanish islands in the Gulf of Guinea of volcanic origin. The inhabitants are negroes with Portuguese blood said to be the descendants of slaves cast away on the islands. They were practically independent till 1898. Pop. c. 2000.

**Anno Domini**, the Latin term meaning in the year of our Lord which usually in its abbreviated form A.D. is prefixed to the enumeration of the years which have followed the birth of Christ. In practice the date of Christ's birth is taken to be A.D. 0 so that the Christian or Anno Domini era actually started 4 years after the date assigned to the birth of Christ.

**Annuals** are plants which live but one year passing in this time through their whole life cycle and setting seed. Annuals are believed to have evolved late in the history of the earth and are among the highest forms of plant life. They rarely build a large vegetative structure but direct all their energy towards the setting, protection and disposal of the seeds.

**Hardy annual** may be sown in the open ground where they are to flower. Some can be sown in the autumn but with most February or March is quite early enough and for succession May or even June. Crown in circular patches rather than the rows usually popular. Annuals are much more effective.

**Half-hardy annuals** are those which require to be raised under glass and

well established before planting in the open ground. The chief conditions are plenty of light, but not bright sunshine, and careful and constant watering. Avoid sowing too thickly and prick off as soon as large enough to handle.

**Annuity**, a periodical payment for a number of years, either fixed, or depending upon some condition, or during the lifetime of some person, called the nominee. Where the period is fixed, the annuity is called an *annuity certain*.

**Annular Eclipse**, see **EARTH**

**Annunciation** is a festival observed by the Christian Church on March 25 to commemorate the announcement by the Angel Gabriel to Mary that she was about to become the mother of Jesus Christ. In England the feast is often called Lady Day, and is a quarter-day.

**Annunzio** [AN-NŌŌN'-TSYŌ], **Gabriele d'** (b 1863), Italian poet and novelist. His works combine the frankness of modern treatment with the richness of the Renaissance, and though some critics alleged that his early writings unfavourably influenced public morals, others welcomed them as showing a refreshing vitality. In addition to poems, novels, and stage tragedies, d'Annunzio showed an intense patriotism characterised by an energetic political and military activity. He took a leading part in Italian opposition to the other Allied Powers and to President Wilson at the Peace Conference in 1919 particularly over the disputed question of Fiume. A strong Fascist, d'Annunzio followed the course of this movement during his post-war retirement, and was created Prince of Monte Nevoso in 1924. The best of his writings include *The Triumph of Death* (1894); *Francesca da Rimini* (1902), *Per la più grande Italia* (1915), and *Contro uno è contro tutti* (1919).

**Annus Mirabilis** is a Latin term meaning "the wonderful year," and specifically applied in English history to the year 1666, the year of the Great Fire and of the defeat of the Dutch

fleet, concerning which Dryden (*qv*) wrote a poem bearing this title.

**Anode**, the solid conductor (electrode) in contact with a gas or liquid, by which electric current enters the latter, hence the *positive* electrode of a cell or tube taking a current, and the *negative* electrode of a cell delivering a current. See also **ELECTRO-CHEMISTRY**.

**Anonymous Literature**, a term of wide application, including the accidental or unintentional anonymity of traditional literature, such as ballads, etc., and also the intentional suppressing of an author's name for such reasons as religious or political intolerance. Such general pen-names as "A Lady" or "The Author of Waverley" are more properly *anonyms* than *pseudonyms*, since they do not ascribe the authorship to a particular person, and thus differ from the pseudonymous work of, e.g. Macpherson or Chatterton (*qqv*). *A Dictionary of Anonymous Literature* was begun by Samuel Halkett (1814-1871) and continued by John Laing (1809-1880), and has been recently reissued in a revised form by Kennedy, Smith and Johnson.

**Anopheles**, see **MOSQUITO**

**Anquetil-Duperron**, **Abraham Hyacinthe** (1731-1805), French orientalist. He had an enthusiasm for Eastern languages, and travelled in India in search of Oriental manuscripts. His main publications were *Zend-Avesta* (1771), and *Recherches historiques et géographiques sur l'Inde* (1786), the former being the collection of his Oriental discoveries.

**Anselm**, **St** (1033-1109), Archbishop of Canterbury, succeeded Lanfranc as Prior of the abbey of Bec, in Normandy, and became abbot in 1078. When the Archbishopric of Canterbury fell vacant on Lanfranc's death in 1089, Anselm, after a four years' seizure of the revenues of the see by William Rufus, was appointed to the position. Opposition between King and Archbishop soon followed, and, after a brief reconciliation, Rufus again

confiscated the revenues during Anselm's absence in Rome. The Archbishop did not return to England until recalled by Henry I after Rufus's death and was immediately involved in further quarrels which were not settled for seven years. Anselm lived only two years more, dying on April 21 1109. In 1491 he was canonised. His extraordinary strength of character, his depth of thought and his conviction of the justice of his cause reveal themselves as much in his ultimate triumph over two kings in a fourteen years' struggle as in his writings. As a thinker and one of the first of scholastic writers he merits a high place in the history of mediaeval philosophy. Among his works were *Cur Deus Homo*, *De Veritate*, *Prologion* and *Monologion*.

**Anson, George Anson, Baron** (1697-1762). First Lord of the Admiralty and Admiral of the Fleet, commanded a squadron of six British ships in 1740 in an attack on the Spanish possessions in S America. Adverse conditions reduced his vessels to one and after capturing a town and a rich galleon he returned to England in 1744, having circumnavigated the globe. To him were due many of the administrative reforms in the Navy which manifested themselves for over a century following his work as First Lord of the Admiralty. An account of his voyages may be read in *Voyage round the World* (148).

**Anstey F.**, pen name of Thomas Anstey Guthrie (1856-1933). English humorist. His best known work is *Vice Versa* (1882). Others are *The Brass Bottle*, *The Man from Blakelys* (1901) and contributions to *Punch*.

**Antananarivo**, capital of Madagascar, situated inland on E of island on a ridge some 700 ft above the neighbouring plain and c 4000 ft above sea level. Old town built of timber; modern French town includes residency, cathedrals (Roman Catholic and Anglican) and observatory; important wireless station. Rail con-

nection with port of Tamatave. Pop. (including 6700 Europeans) 97 500.

**Antarctic Regions**, Continental land mass situated within the Antarctic circle (66° 30' S) completely isolated from the remaining continents of the world by a continuous ocean belt c 600 m across generally called the Antarctic Ocean but actually comprising the S parts of the Atlantic, Indian and Pacific Oceans. The S pole is almost in the centre of the continent.

**Relief**. The Antarctic regions have been only partially explored so far as is known; the continent comprises a lofty plateau from which rise some fine volcanic ranges (e.g. Mount Erebus 13 300 ft, an active volcano in Victoria Quadrant). Immense glaciers cover almost the whole of the continent and it is characteristic of the severity of conditions that the ice streams are continued into the sea in the form of a vast continuous barrier (e.g. Ross Barrier with a frontage of 400 m) from which the typical tabular pack ice of the S polar regions is detached. For the sake of convenience Antarctica is divided into the Victoria, Ross, Weddell and Enderby Quadrants, each of 90° longitude lying S of Australia, the Pacific Ocean, S America and Africa respectively. Area over 5 000 000 sq m.

**Geology**. Beneath the ice-cap the plateau is apparently built of ancient rocks and there is evidence of a connection between the Antarctic volcanoes and those of S America via the S Shetland Islands, S Orkneys and the Sandwich group. Predominant rocks are Permo-Carboniferous and coal has been found testifying to the existence of vegetation at the pole in some remote period.

**Climate**. Owing to its complete isolation from more genial continents the Antarctic climate is more harsh than the Arctic. The west winds sweep round the globe over an unbroken sea belt in the S Hemisphere between 55°-65° S, covering the Antarctic with a zone of severe weather.



race of men, or at best, by children. Nevertheless, as an artist to day would not allow a child to scrawl on a canvas upon which he himself was engaged, neither would the cave-dwelling artist, and there is really no reason to believe that the two styles were executed at different periods or by different people.

*The Cults of Nutrition, Death, and Motherhood* The discrepancies in style, the invisibility of the pictures and the supreme care that has been lavished upon them all point to one conclusion, namely, that man, even at this early period, yearned after the mysteries of an unknowable beyond. The drawings may be regarded as an act of prayer, a form of sacrifice, a religious mystery. All the animals represented are species suitable for food. Some of them are even drawn with unmistakable signs of blood issuing from wounds near the heart, thus showing that the cave-man knew the vital importance of this life-giving fluid. He had learned by experience that famine was more fearful than fierce beasts. Lions and bears he could defeat by physical means, but it was to psychic means that he needs must turn to fight the spectre of hunger, which led to death—that least desirable state of all.

Of his dead, early man took great care, painting the body with red earth in imitation of blood—the life-giver—and covering it with earth to preserve it from prowling beasts. There was no guarantee that the dead would not rise again, and that in no metaphorical or mystic sense, but in real earnest. Sometimes, upon or beside a body, was placed a cowrie shell, and here we find the merging point of the mysteries of birth and death, the Alpha and Omega of man's allotted span of years.

In the disproportionate drawings of the female figures in the Mentone caves we see the beginning of a form of worship that persists in some parts of the world to-day—Mother-goddess worship. Birth, to early man, must have presented a more awesome mystery than death. A development of the Mother-goddess cult is expressed in

teeth and claws worn as amulets, sometimes with and sometimes without cowrie shells.

The process of reasoning that converted death-dealing weapons of wild beasts into life-preserving amulets for mankind must have been that the teeth and claws of female animals with young were employed largely to protect the young. Death to the attacker meant life to the offspring, and again in the restricted reasoning of so early a period in the race's development birth and death became confounded and appeared as dual aspects of one mystery, as the front and back of the same thing. They have remained inextricably mixed to the present day and in many modern doctrines of reincarnation, and also of "life after death," traces of the first dawn of mysticism may be found.

*Economic and Social Aspects* During these millennia of mystic and utilitarian development, man's economic and social organisation remained stationary, the social perforce depending as it does on economic environment.

Man, at this period, was exclusively a "food-gatherer." Agriculture is no a primitive instinct—it is a science.

Vegetarian by ancestry and non-belligerent by physique, early man was driven by the great apes from the shelter of the trees, with their plentiful supply of nuts and fruit on to the plains and open spaces, where he needs must develop an omnivorous appetite, living on the comparatively sparse edible vegetation and "working by the sweat of his brow" to catch and kill animals, birds, and fish. Population was small and the world wide. There was no limit to an individual person's territory; he had but to wander forth, eating when and where he could.

Social organisation was on the basis of Darwin's conception of the primitive horde, consisting of a closely related inbreeding family. The secondary sexual characteristics of the human race indicate that in a state of nature

we are a polygamous species there fore it is reasonable to suppose that each adult male had several females who regarded themselves as closely allied to him and who were the mothers of his children and for whom he specially provided though the entire group was interdependent for sustenance and protect on While the birth rate remained high and the sexual ratio normal that is producing a preponderance of females there could be no reason for the horde to break up therefore each group remained isolated from its immediate neighbors

When circumstances either climatic or nutritional had persistently undermined the constitution of the group and there were insufficient nubile females to provide wives for the young men then and only then was there reason for these latter to break away conveying females with them or failing that stealing wives from some neighboring group So the primal hordes arose came to and passed maturity and declined This rapid increase of population together with the growing difficulty of providing for wives and offspring drove man farther and farther afield and heralded the approach of the Protohistoric period (see PROTO-HISTORIC MAN CULTURE DIFFUSION or)

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**Anthropology Physical.** Physical anthropology is not strictly a direct descendant of Darwin because it is not biology neither can it be considered pre Darwinian in origin for it is not medicine Somewhere between the two the "new science" takes its stand concerning itself exclusively with the non utilitarian aspects of the human frame culling a little from paleontology and a little from geology but nevertheless standing alone and independently searching for further light

**Darwin** Darwin's theory is now

almost universally accepted even by the section of the community which holds to traditional religious views but though man is descended from monkeys he is not descended from any type of monkey that is extant The journey has not been

Monkey—Missing Link—Man  
but rather

Extinct Monkey—Missing Link < Man  
Link < Monkey

thus making modern apes our very distant cousins and by no means our brothers

**Antiquity** Before examining the story that earth has to tell of man's descent it may be well briefly to outline the story of the earth and acquire some idea of geological time In the Primary Age all invertebrate animals had made their appearance and with their fossilised remains are found traces of the first (vertebrate) fishes In the Secondary Age we find reptiles birds and the lowly mammals In the Tertiary Age mammals developed as far as the *Primates* or monkey family The Quaternary Age which still lasts is the age of man This age is divided into two parts *Pleistocene* or ancient and *Holocene* or recent the latter commencing with the final recession of the ice

There have been four ice ages two of which have occurred in the Quaternary era These ice-ages are named GLACIAL MINDEL RISS WURM The periods between when the climate became very warm are termed interglacial periods and numbered one two three

The Holocene or recent has very little to show save that the peat and moss formations are still in process of growth The flora and fauna are exactly as to-day thus indicating that climatic conditions have not changed

The Pleistocene falls into three subdivisions—Lower Middle and Upper—the last mentioned being the most recent The Upper Pleistocene was the postglacial period The climate was very cold and very dry and great herds of reindeer roamed undisturbed over

the steppes and tundras. The Middle Pleistocene was the last great glacial phase. The climate was, naturally under the circumstances, cold and wet. The mammoth (*Elephas primigenius*) was plentiful, and with him the woolly Rhinoceros (*Rhinoceros tichorhinus*). The Lower Pleistocene saw one interglacial phase, and the end of the penultimate ice-age. This is sometimes called the Hippopotamus Age, because these creatures were in the zenith of their development, and were the most important numerically. With them are found remains of an early form of mammoth (*Elephas antiqua*) and Merck's rhinoceros.

Thus we see through these ages that change after change has come upon the earth. Now the ice caps have spread from the poles almost to the equator, compressing the meteorological zones of the earth into a small belt between them, now they have receded and subtropical heat has followed them to the N latitudes.

Before and behind the inevitable, grinding, earth-chiselling ice, flora and fauna have progressed S and N—little Alpine plants being left to flourish in the high places, mighty mammoths becoming extinct and man unequipped, but always superior, rising above the vicissitudes and rigours of climate, living on from age to age, improving his material and mental equipment, until he has now learned to be master of the earth, even if not, as yet, of himself.

Having now familiarised ourselves with the passage of geological time, and grasped some idea of the physical phenomena taking place during the period, we will see what the earth can reveal concerning man's developmental history.

**Java.** In 1891 an interesting find was made in Java by Dubois, a Dutch surgeon. In a Pleistocene stratum, contemporary with the Günz ice-age, at a depth of 50 ft, a skull and thigh-bone came to light. Although these lay some few yards apart, they were at the same level, and there was no

reason to doubt their being part of the same skeleton. Java, at this period, would have been part of the mainland of Asia.

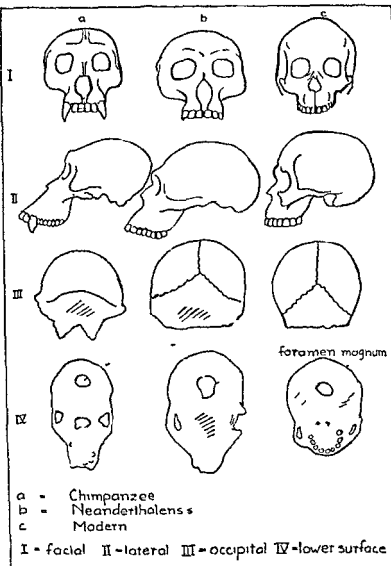
The skull is low, with very high ridges of bone above the eyes (supra-orbital ridges). The cranial capacity (volume of cavity occupied by the brain) is 850/900 cubic centimetre. This is half as much again as in the great anthropoid apes, but only 50 per cent of the average for man. The length from front to back is great in comparison with the width. The formation is termed Dolichocephalic and is a peculiarly human distinction, the apes being Brachycephalic, i.e. broad-headed. The thigh bone is straight, indicating an upright stature.

This creature was neither man nor monkey. It is the ideal "Darwin missing link," although, of course, upon such slender evidence no such claim can be made for it. It is, of the whole, nearer to man than it is to monkey, but nevertheless cannot be considered of the genus *Homo*. It is therefore left to stand alone, a class by itself—*Pithecanthropus erectus*.

**Heidelberg.** Another interesting find was made by Schoetensack, in 1907, at Heidelberg, Germany. In the Mauer sand, at a depth of 80 ft, he unearthed a lower jaw. The stratum is contemporaneous with the second interglacial period.

The relic is peculiar in having a very broad ascending ramus similar to the great apes, the chin is undeveloped from the human standpoint, but nevertheless is considerably stronger than in the ape, whilst the contour, seen from above, is oval, definitely human, the apes having a narrow jaw. The relic on the whole merits to be classed in the human family and is termed *Homo heidelbergensis*.

**Pitldown.** These remains were discovered in unusual and somewhat romantic circumstances. Mr. Charles Dawson, a gentleman connected with the legal profession, had for years made an amateur study of the geology of his



Apes and Man—Skull formations.

district On one occasion, riding through a Sussex lane near Piltdown, he was astonished to see workmen opening up a gravel pit Geologically, gravel was out of place at this spot Mr Dawson questioned the men, who were natives of the district, and had known of the gravel deposit all their lives It seemed that there was nothing to be gained in the way of information, so telling the men to keep anything unusual they might dig out, Mr Dawson proceeded on his way Some months later, passing the spot again, he dismounted and enquired if anything of interest had turned up Nothing had, save an old coconut shell, at which the men had amused themselves during their dinner-hour by throwing stones Further investigation revealed in the coconut shell a fossilised skull-cap, which the expert marksmanship had succeeded in shattering to fragments Parts of it, alas! had already been shovelled up and used to metal roads in the vicinity, but a careful search in the pit revealed portions of the face, half a lower jaw, and several teeth

Owing to the difficulty of accounting for a gravel deposit at this place, it is almost impossible to fix the probable age of the bones They are usually attributed to the third inter-glacial period, but may be considerably older, the skull having been broken, it is not possible to measure the cranial capacity at all accurately, but it has been variously estimated at 1170-1300-1500 cubic centimetres

Again, in the Piltdown discovery we have a definitely human head accompanied by an equally definitely simian jaw However, the relic is considered human It is named *Homo Dawsoni*

*Neanderthal* The fossils discovered at Neanderthal in Germany in 1859 give this name to the finds, all of the same type, from several different sites in W Europe They date from about the middle of the last (Würm) glaciation, and indicate the existence of a powerful race

The Neanderthal man was short in

stature, with curved thigh-bones The great breadth of the bones indicates that they supported a powerful musculature He must have walked in a stooping position with the head thrust forward, for the foramen magnum, an opening through which the spine passes into the head, is rather to the rear

The forehead was low, with heavy supraorbital ridges The jaws were powerful, and prognathous or protruding The average cranial capacity of Neanderthal man was 1550, which is equal to modern man's average Ugly and monkey-like though he is, he nevertheless finds a place in the human family, in fact, judging from the shape of the palate, it is possible that he spoke some sort of language This type is called *Homo Neanderthalensis*

*South Africa* The relics found in Broken Hill Mine, Rhodesia, in 1921 differ so little from Neanderthal man that the creation of a subspecies, *Homo rhodesiensis*, is hardly justified The same may be said of the Taungs skull (*Australopithecus africanus*) discovered in 1925 in Cape Province, South Africa The age of the deposit could not be accurately determined, for other skeletal remains were all of animals existing to-day, but the species in Africa have not changed during the whole of the Quaternary Geological Age

*Peking Man* In 1929, on a site 40 m S W of Peking, China, a skull was discovered which is considered to be contemporary with the Java skull Peking Man had, however, a greater cranial capacity, and is termed *Sinanthropus pekinensis*

*Mentone* The foregoing types, though *Homo*, are by no means direct ancestors of the human race Although of the same genus they are of different species They might be regarded as our great-great-grand-uncles, but not as our fathers and forebears

It was not until the opening-up of the Mentone caves that our direct ancestors were found, and in them we

have nothing to be ashamed of unless it be our present physical decadence for these cave-dwelling early representatives of *Homo sapiens* are on the average much finer specimens than we are ourselves. They were very tall and upright with a cranial capacity of 2 800 cubic centimetres which is 15-20 per cent higher than the modern average.

These men were the prehistoric artists and mystics (see ANTHROPOLOGICAL CULTURAL) who by their appreciation of the possibilities of a great beyond sowed the seed from which our modern advanced state of knowledge has grown. They were a high foreheaded people with but slight supraorbital ridges and facial proportions that would be considered handsome measured by to-day's standards. These people have been named the Cro-magnon Race and are now extinct although some authorities maintain that there is still a definite Cro-magnon type to be found in S. Europe.

**The Brunn Race** This is well represented in Central Europe and a skull found near London in 1888 has been identified as the Brunn type. They were of the species *Sapiens* but inferior to Cro-magnon people.

**The Grimaldi Race** These remains were also found in the Mentone caves but at a lower level than the Cro-magnon remains. They are noticeable chiefly as being a Negroid type. The forearm and lower leg are long in comparison with the upper arm and thigh.

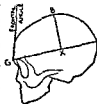
**THE ANTHROPOLOGICAL INDICES** Physical anthropology is distinguished in having set standards by which comparative measurements of the human physique may be made. Chief among these is the famous Cephalic Index or skull measurement.

The points from which measurements are made and angles calculated are:

(1) **The Glabella** the base of the forehead immediately above the root of the nose.

(2) **The Inion** the most rearward point of the skull. An imaginary line extending between these two points is called the Glabella-inion line and is represented by the letters GI.

(3) **The Bregma** which is the point of intersection of the sutures which divide the frontal from the parietal bones. It is usually the highest point of the skull and is represented by the letter B.



**Bregma Angle** A anthropological index. This is the angle formed by BGI a high forehead naturally giving a big angle.

**Cranial Height Index** This is measured by dropping a perpendicular from the Bregma (B) to the Glabella-inion line (GI) the point of intersection being termed X.

**Bregma Position Index** This is determined by dividing the frontal portion of the line GX into the whole line GI. A low index i.e. Bregma in a frontal position indicates a high forehead.

**The Frontal Angle** This is measured in relation to the GI line by a line extending from the glabella up the front of the forehead.

**Brachycephalic** This is the term used to describe a broad head the breadth of which is above 80 per cent of its length.

**Mesocephalic** The term used to describe a medium head when this figure is between 75 and 80 per cent.

**Dolichocephalic** is used to describe a narrow head when the result is below 75 per cent.

**OTHER STANDARDS OF MEASUREMENT** Several attempts have been made to lay down standards of measurement for prognathism (protruding jaws), nose shape and tallness but owing to the fact that a great deal of overlapping takes place no satisfactory conclusions have been reached. It is obvious that

(to take a concrete example readily available to all) a big Japanese might easily be taller than a small European, although it would be correct to regard Europeans generally as taller people than Japanese

Pigmentation, or skin colour, is not a reliable test either, as again, to take a ready example, a swarthy Spaniard may be darker than a fair Hottentot. The pigment in the human skin is the same material in all races. "Whiteness" and "blackness" are only a question of quantity, not of quality.

**Hair** The hair, both in its texture and quantity, is a good test for race. As there are three distinct races, Negroid (Black), Mongoloid (Yellow), and Caucasian (White), so there are three distinct kinds of hair which persist even when blood is admixed.

The Negroid race is distinguished by "woolly hair." This in cross-section, beneath the microscope, is revealed to be flat or riband-shaped.

The Mongoloid race has "straight hair," round in cross-section.

The Caucasian race has "wavy hair," oval in cross-section, and the



Typical Caucasian

white man grows considerably more, both on the head and body, than the two previous peoples mentioned.

#### Existing Races

No term is more misapplied than the word "race." We have such expressions as "the German race," "the Aryan race," and "the Jewish race," whilst actually the first is a nation, the second a language group, and the third an intermarrying religious caste. "Race" implies inherited physical character-

istics, and, as already stated, there are but three races.

The Caucasian or white race is divided into four subsections, three of them resident in Europe and one in India. Racial distributions in Europe

are no respecters of national frontiers, and cut right across the map E and W.

(1) *The Nordic* people are tall and fair, having blue eyes, and occupying N Europe.

(2) *The Alpine* people are shorter and darker than the Nordic, and occupy the band across Central Europe.

(3) *The Mediterranean* people are on the whole shorter and darker than the Alpine people, and occupy the area

that their name indicates. It is not correct, however, to regard the Alpine people as a transition stage between the Nordic and the Mediterranean, for the Alpine folks are brachycephalic, whilst the remaining two are dolichocephalic.

The Mongoloid or yellow race is also subdivided into the Mongoloid proper of Asia, the Malaysian of the E Indies, and the American Indians.

The distinctive and striking "Mongolian eye" which, by the layman, is considered to be oblique in the socket, and therefore as marking the greatest difference between the "yellow" and the "white" race, is actually of comparatively little importance. The American Indian, with the straight eye, is no less "Mongolian" than the Chinese with the oblique. Actually the "Chinese eye" is set in the socket at exactly the same angle as the



Typical Mongoloid

European eye the difference lies in the development of the epicanthic fold a formation of the upper eyelid that covers the canthus that little triangle of ugly red flesh easily dis-

cernible beside the nose in the European eye. This fold has developed since the American branch of the Mongoloid family migrated across the Behring Straits.

The Negroid race is again subject to triple subdivision the African Negro proper the Oceanic Melanesian the Negrito or pigmy. The first and second groups are very similar and



Typical Negroid

might easily be confused one with another. The salient point however is the nose. The Negro people have a broad fat nose the Melanesian a broad aquiline nose.

The African Bushmen and Hottentots are yellowish in colour brachycephalic short legged hollow backed and inclined to an excessive development of fat on the buttocks (steatopygous) but nevertheless they are distinctly Negroid.

Racial grouping is not determined so much by the continents men cover as the seas they surround. The Caucasians in Europe Asia and N Africa surround the Mediterranean Sea the African and Oceanic Negroids are situated E and W of the Indian Ocean whilst the Mongoloids of Asia, Oceania and N and S America enclose the Pacific.

**Easily Classification.** In the middle of the 18th cent. Linnæus made an attempt to classify the races of men. His phraseology was

*Eu oparus albus* = European white,  
*Asia icus fulvidus* = Asiatic yellow  
*Americanus rufus* = American red  
*Afer niger* = African black,

thus making four races.

Blumenbach in 1795 again made a classification as follows:

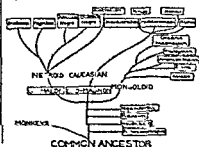
Caucasian = White  
Mongolian = Yellow  
Ethiopian = Black  
American = Red  
Malayan = Brown

Both these attempts admirable as they were being based upon pigmentation were wrong they still linger however and are liable to be quoted in school books. The modern triple grouping is based entirely on hair section and is reliable.

**Superiority.** The question Is the black or yellow man superior or inferior to the white man? is not easily answerable in terms of racial characteristics.

The epicanthic fold of the Mongolian eye might be considered less animalistic than the naked canthus of the European eye. The thick lips of the Negro are farther removed from the liplessness of the ape than either the Caucasian or Mongoloid whilst the hairiness of the white man is a more simian characteristic than is possessed by the other two races. The question is not really one of inferiority or superiority but of difference.

Negroid Caucasian or Mongoloid are all blood brothers in one great family which might be graphically represented thus —





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**Anthropometry**, see **BIRTHLON**

**Anthrophagy**, see **CANNIBALISM**

**Anti-Aircraft Gunnery** Two types of weapon are used in artillery defence against aircraft--(a) heavy fixed guns of 4-in calibre, and general-purpose guns of 3-in calibre for use against high-flying aircraft, and (b) light automatics for use against planes flying low. The high speed of the target makes necessary high explosive bursts from the heavy guns, and intensive spraying from the automatics. Anti-aircraft guns have a horizontal movement of 360° and a vertical one of 90°, automatic breech-loading, high muzzle velocity, and electric predictors or range-finders. At night the guns co-operate with sound-locators, for detecting the position of oncoming aircraft, and with searchlights which may throw a beam up to 4000 yds. See also **GUNS**

**Antibes** [AHN'-TSE], town, S France, on Gulf of Nice, department of Alpes-Maritimes. Flowers, fruit, oil, and fish. Includes Juan-les-Pins, both winter resorts. Pop c 13,000

**Antichlor**, see **BLEACHING**

**Antichrist**. A body of tradition both in the New Testament and in the writings of the Early Fathers exists to the effect that shortly before the end of the world, an opponent of Christian teaching will arise under the name of Antichrist. In Apocalyptic Literature Antichrist is represented as the ruler of the evil spirits. Various people have been described as Antichrist, among them, Nero, Mohammed, Napoleon I and III, Luther, Lenin, and the ex-Emperor William II of Germany

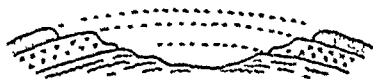
**Anticlimax** (or *Bathos*), ludicrous descent from the elevated to the commonplace in speech or writing

**Anticline**, a fold in the earth's crust. The beds are folded along a definite

axis from which they dip away on both sides to form an arch or saddle, though this is almost always destroyed by weathering

Unless terminated by a fault, the folding gradually dies out as it runs across country. It may form low, gentle undulations, often over a wide area, as in the Vinta Mountains of Wyoming, or a series of sharp curves as in the Swiss Jura

The axis of an anticline is frequently inclined along its length, and thus forms a pitching anticline. The big anticline of the Pennine Hills pitches to the S



ANTICLINE WITH CREST OF FOLD WEATHERED AWAY



SHARPLY CURVED STRATA FORMING ANTICLINES IN THE SWISS JURA.

#### Anticline

If one side of the fold is vertical, the structure is termed a monocline, of which the best example in this country is in the Isle of Wight, where the beds are folded along an E and W axis and on the N of the island are nearly vertical. Very large monoclinical folds occur in the W United States. If the vertical axis of an anticline becomes considerably inclined towards the horizon, the fold may be bent right over so that the strata are inverted. This has happened in the Appalachian Coalfield, the Alps, and the S uplands of Scotland. See also **MOUNTAINS**

**Anti-Corn-Law League**, a political body formed in Manchester in 1838 as

an expression of growing commercial and free trade opinion with the object of securing the repeal of the Corn Laws (qv). It was led by Cobden, Bright and others. On the achievement of its aim it came to an end c 1848.

**Anticosti**, island in Gulf of St. Lawrence, Canada, 130 m long and 30 m broad. Important lighthouse station.

**Anticyclone**, *see* METEOROLOGY.

**Antidotes**, *see* POISONS.

**Antifebrin**, trade name given to acetanilide (qv) when used as an antipyretic.

**Anti-friction Metals**, *see* ALLOYS BEARINGS.

**Antigua** (1) Island of Leeward Group, British W. Indies, administrative centre of Presidency including islands of Barbuda and Redonda. Antigua is rocky and subject to hurricanes and drought. Exports sugar, some fruit is grown. The legislative council of the Leeward Islands meets in Antigua, which is the residence of the Governor. Area 108 sq m, pop. of Presidency (1931) 31,900 of whom all but c 1000 reside in Antigua. (2) Town, Central America, former capital of Guatemala, coffee growing. The handsome old town is partially in ruins.

**Anti-knock agents**, the popular term applied to substances which when added to fuel for internal-combustion engines decrease the velocity of combustion to an extent sufficient to inhibit detonation.

The phenomenon of knocking in a motor-car engine is due to the fact that the fuel is burning at too fast a rate and that therefore the power developed instead of being applied to the piston is being wasted since the rapidity of the explosion is such that it tends to drive the piston down before it has finished its upward stroke, hence the unpleasant sound known as the knock.

The factor that causes the knock is chiefly a too high compression ratio in the engine. So most engines are sent out with a compression ratio that is

adjusted to suit the type of fuel present. Knocking chiefly occurs in those engines that have had their compression increased by a deposit of carbon on the cylinder head or else that are running at too slow a speed to take full advantage of the energy developed in the cylinder. This explains knocking when a motor-car is slowly climbing a hill in top gear.

Since the power that is developed by an internal-combustion engine increases with a rise in compression it would obviously be very desirable to increase the latter since more power could then be obtained without increasing the size of the engine or its fuel consumption. Search has therefore been made for a fuel that will burn satisfactorily in engines having a compression ratio higher than that which used to be the rule in motor-cars some years ago (about 4-5:1).

Naturally not all fuel have the same rate of combustion and some petrols have a much better anti-knock action than others. Such is especially the case in petrols having a high content of aromatic constituents such as those obtained from the oilfields in Russia and to a lesser extent those from California. Fuels that have been produced by the cracking process (*see* PETROLEUM) have a better anti-knock action than straight-run distillates.

Among non-petroleum fuels that are used in internal-combustion engines alcohol and benzene have good anti-detonating properties. The latter is used to a considerable extent in the form of benzole mixture and alcohol (qv) is also coming into use as a motor-car fuel both by itself and more commonly blended with petrol. These types of fuels can however only supply a part of the demand and research was thus instigated into the possibility of the manufacture of synthetic anti-knock agents. This research has been extremely successful and several synthetic products have been manufactured which on addition to petrol greatly increase its anti-

detonating properties. The chief of these substances is an organo-metallic compound, lead tetra-ethyl,  $Pb(C_2H_5)_4$ .

Other organo-metallic compounds employed in this capacity are iron carbonyl (principally in Germany) and di-ethyl telluride. All these compounds are highly poisonous, and great care must be taken in handling them, although when mixed in petrol the dilution is so great that no special precautions are really necessary, nevertheless, the petrols to which they are added are usually coloured by the addition of a dye so that they shall not be used for cleaning purposes, when there would be a tendency to absorption by the hands of the operator.

The testing of these fuels is carried out in a specially constructed petrol engine which is fitted with an apparatus to register whenever knocking occurs, and whose compression is variable. The fuel is experimented with at various compression ratios, and the highest ratio at which knocking does not, under given conditions, occur is called the Highest Useful Compression Ratio (H.U.C.R.). This figure is used as a means of expressing the anti-knocking powers of the fuel under test.

**Antilegomena**, the name given to certain books of the New Testament, the authenticity of which was disputed in the 4th cent. They are the 2nd Epistle of St Peter, the Epistle of James, the Epistle of Jude, Epistle to the Hebrews, and the 2nd and 3rd Epistles of John and the Book of Revelation.

**Antilles**, a name applied to the W Indies. The term was used by fanciful geographers in the Middle Ages for certain supposed lands in the open sea to the W of Europe. The Greater Antilles comprise Jamaica, Puerto Rico, Haiti, and Cuba, the Lesser Antilles all the smaller islands.

**Antimony**. (For the constants of antimony see the article ELEMENTS.) Antimony is a silver-white metal that burns in air when heated. It exists

in four allotropic modifications, one of which, amorphous antimony, is explosive if heated.

Antimony was early known in the form of the naturally occurring sulphide  $Sb_2S_3$ , stibnite. This substance was used in the Orient as an eyelash paint. The sulphide is very easily reduced to the metal, and this latter was known to the earliest alchemists.

The modern method for the preparation of antimony is to heat the crude ores so that the sulphide, which melts at  $550^\circ C$ , can be poured off, this is then roasted so as to convert it to the oxide, and the latter is reduced to the metal with carbon in the form of coal. The sulphide may also be directly reduced with iron. The greatest proportion of antimony is manufactured in China, and the world production is of the order of 30,000 tons per annum.

The principal use of antimony in industry is as a constituent of various alloys, such as type-metals, Britannia metal, pewter, and anti-friction metals. Antimony in the proportion of 15 per cent is also used for hardening lead. Taken internally antimony is toxic, the symptoms very closely resembling those of arsenical poisoning.

**Antimony Compounds**. Of the inorganic compounds of antimony those that are commercially important are the oxides, which are used in the manufacture of paints and enamels, and the sulphide, which is employed as a red pigment, particularly for rubber.

Various other inorganic antimony compounds find uses in chemical industry and in medicine, such for instance as the oxychloride (powder of Algaroth), which is used as a smoke-producing material. The organic compounds of antimony are numerous and important from the medicinal point of view. The commonest and best known is *tartar emetic*, which is *antimony-potassium tartrate*. It is manufactured by boiling together in water antimony oxide and potassium hydrogen tartrate. In addition to the use which its name implies it is also employed in dyeing as a mordant.

**Antinomianism** a doctrine held in the 15th and 16th cents. to the effect that Christians were not bound by moral laws but being justified by faith alone were exempt from obedience to the Ten Commandments. Views of a similar nature were held by some in the early period of Christianity and in the Middle Ages.

**Antinous** [AN TI NŌ US] famous for his extraordinary beauty was companion and favourite of the Emperor Hadrian who after his death by drowning in the Nile in A.D. 12 raised him to the rank of the gods.

**Antioch** (1) (*Antakīyah*) city in Syria on R. Orontes 90 m from the coast produces cotton cereals tobacco and olives. Situated at a vital point on ancient trade routes Antioch was formerly of great importance. It was founded by Seleucus Nicator after 301 B.C. and became the capital of the Seleucid empire. It came to Rome in 64 B.C. it was adorned by successive Roman emperors. A scene of the activities of the apostles Peter Paul and Barnabas it became the metropolis of Christianity after the fall of Jerusalem here the name of Christian was first applied. The city was destroyed by the Persians in A.D. 538. During the First Crusade Antioch captured in 1098 became the capital of a Latin principality (see CRUSADES). Turkish from 1517 to 1918 (except for a short Egyptian occupation in 1840) it was occupied by the British under Allenby in Oct. 1918 and mandated to France in 1920. (2) Name of several ancient cities of Seleucid foundation. The most important after (1) was Antioch in Pisidia (central Asia Minor) renamed Caesarea by Augustus. ruins of fortifications still standing.

**Antioch Battles of** (1) c. 244 B.C. the Egyptians under Ptolemy Evergetes defeated the Syrians under Seleucus. (2) A.D. 2 - the Romans under Aurelian defeated the Palmyrians under Zenobia. Siege of (1st Crusade) Oct.-11 1097-June 3 1098 the Crusaders under Godfrey de

Bouillon captured the city from the Saracen garrison.

**Antiochus**, name of 13 Syrian kings of the Seleucid dynasty from the 3rd to the 1st cent. B.C. The house was continued by the same line of kings as rulers of Commagene (q.v.). **ANTIOCHUS SOTER** ruler 281-252 founded and secured the dynasty by defeating the invading Gauls and fighting in Egypt. **ANTIOCHUS THEOS** his son succeeded him until 246. **ANTIOCHUS THE GREAT** nephew of **ANTIOCHUS THEOS** (233-187) was the greatest of the line annexing provinces in Asia Minor pressing out between the Indus and Persia and entering Jerusalem. His power was enormously extended by wars but in an invasion of Greece he was routed by the Romans (190) and forced to resign his conquests in Asia Minor besides having to pay the cost of the war. **ANTIOCHUS EPIPHANES** (168-164) defeated the Egyptians in their attempt to regain Palestine several times invaded Egypt plundered Jerusalem and persecuted the Jews who rose against him in the Maccabean revolt. **ANTIOCHUS SIDETES** (137-118) regained by strong rule some of the lost Syrian provinces but was killed in battle and during the reigns of the remaining kings Syria was involved in internal wars until in c. 65 B.C. it was annexed by Pompey and became a Roman province.

**Antipater** (c. 398-319 B.C.) Macedonian regent and general of Alexander the Great. He put down risings in Thrace and Sparta (331) and when in command of Macedonia after Alexander's death defeated the insurgent Greeks in the Lamian War (323).

**Antipodes Islands** a number of small rocky uninhabited islets S. of New Zealand at the opposite side of the earth to England.

**Antipopes** see **LOPES**.

**Antipyrine** (*Analgesine Anodymine* *Phenazone* *Ipyrazine*) a phenyl-dimethyl-iso-pyrazolone a white crystalline powder melting at 113°C. Antipyrine is of importance in medicine as

it is a valuable means of reducing pyrexia (excessive body temperature), it is also of value in minimising neuralgic pains.

**Antiquaries, Society of** The first society of this kind in England was founded 1572 to promote the preservation of ancient monuments and antiquities. It was disbanded in 1604 by James I, who considered it politically suspect, and it was not until 1717 that the Society of Antiquaries of London was re-formed, receiving a royal charter in 1751. This Society now has its headquarters at Burlington House, London, it is controlled by a council of 20 members, and its President is a trustee of the British Museum. Its journal has been published since 1773.

There are similar bodies in Scotland and Ireland (the Society of Antiquaries of Scotland and the Royal Society of Antiquaries of Ireland), in America, Germany, and elsewhere.

**Antique Furniture** is furniture whose intrinsic merit is enhanced by its age. It is somewhat difficult to decide when a piece ceases to be merely out of date and old-fashioned and becomes antique. According to the customs authorities of the U.S.A., an imported piece of furniture attracts import duty unless it is a hundred years old. Hence there is a tendency to class as antique any piece that has passed its century. This method of classification is, however, too rough-and-ready to be universally true. To be admitted as an antique a piece should possess some essential virtue independent of its age. Few people would claim as antique a badly made kitchen table of 1830. On the other hand, some of the charming Victorian papier-mâché work of 1850, though not a hundred years old, is definitely antique. An antique may, therefore, be defined as an object made in a past generation which, by reason of its inherent excellence, attracts the interest of collectors, and, owing to its comparative rarity, commands an enhanced price.

A point to be remembered is that an old piece of furniture, untouched by

the restorer, is much more attractive now than when it was made. We admire the soft patina (or gloss) produced by years of rubbing and hard polishing, and the "black," mellowed, or "beautifully faded" colouring of an Elizabethan court cupboard, a Chippendale bureau, or a Hepplewhite sideboard.

Moreover, these two qualities of patina and mellowness now form its greatest attraction. A set of mahogany Chippendale chairs, "in original condition," i.e. with the surface unscrapped, and faded to a pleasing nut-brown colour, is worth 2 or 3 times as much as a similar set which has an indifferent colour, and bears evidences of having been repolished. In the 19th cent. the craze for french polishing spoilt hundreds of beautiful Queen Anne, Chippendale, and Hepplewhite pieces. The one aim of the Victorians appears to have been to make an object look new, the aim of modern connoisseurs is to preserve the old appearance. A careful craftsman may be able to remove the pernicious french polish, but it will take from fifty to a hundred years before the old gloss appears.

This leads on to the thorny question of restoration. Furniture, like architecture, suffers from its restorers. But, if a sense of proportion is observed, a fine old piece which has been badly treated can again be made serviceable by judicious repair. After all, even in the 18th cent., furniture must have been broken and repaired occasionally. It is no more a crime to replace a missing piece of veneer, a foot, or a handle in the 20th cent. than it was in the 18th cent. It is perhaps unwise, however, to re-veneer a damaged piece all over, as it then begins to lose its identity, and is fast on the road to becoming a fake.

The mellowness already mentioned permits the juxtaposition of various antique styles, provided they all belong to the same country. Strictly, rooms should be divided into periods, and a Tudor room, a Queen Anne walnut

room or a Chippendale room will look its best if the styles are homogeneous. But in an ordinary sitting room furnished with antiques a walnut bureau bookcase does not offensively clash with a Sheraton card table or a Hepplewhite chair. The introduction however of a Louis XV *chaise longue* would wreck the scheme just as a Chippendale pie-crust table would be out of place in a Louis XVI *salon*.

**Antirrhinum**, see FOXGLOVE FAMILY.

**Anti-Semitism**, a movement directed against the Jews socially and politically which reached an extreme form in the late 19th century and has since been revived at various times in certain countries.

Throughout the Middle Ages Jews were continually persecuted in most European countries nominally on the grounds of the part they played in the death of Christ but also and chiefly from envy of their successful position in commerce and finance and fear of their power as money lenders to which occupation they were restricted by law. The general anti-Jewish tendency is so wrapped up in racial memory that it defies reasonable analysis.

The modern movement and its revival both had their rise in Germany and Austria and though they tapped historic religious antagonism were in fact entirely directed against the Jewish accumulation of wealth and commercial power. The Hegelian nationalism of Germany in the seventies coinciding with a financial crisis and a scurrilous anti-Jewish pamphlet produced a wave of violent anti-Semitism supported by Bismarck, Treitschke and others in 1879. Anti-Semitic leagues were founded and a press campaign conducted. Under the leadership of a Court pastor Adolf Stöcker the Jews were boycotted and insulted and an attempt was made to exclude them from national schools and public appointments.

In 1881 the agitation spread to Russia where medieval hatreds were up and a pogrom was started in thousands of Jews were killed

and Jewish homes burnt. In spite of popular protest in Western Europe repressive anti-Semitic legislation was passed in 1897.

Reaction against this barbarism and sympathy with Jewish refugees damped the anti-Semitic movement for a while but the agitation was pursued in Austria-Hungary through the nineties. In France a wealthy Roman Catholic corporation the *Union Générale* was formed to break the so-called Jewish financial power. The systematic anti-Jewish agitation culminated in the famous Dreyfus (qv) case (1894) in which a Jewish army officer was accused of treason and transported but after tremendous manifestations of public feeling was retried with the result that the whole case was disproved (1906).

Anti-Semitism faded between 1906 and 1914 but was revived between 1917 and 1918 when the Russian Revolution was alleged to have been instigated by Jews.

Another comparatively peaceful period except for Jew-baiting in Poland was broken by the accession of the National Socialists to power in Germany in 1933. With the claim of purifying the German race and freeing the country of Jewish financial control an anti-Jewish campaign was undertaken. Jewish shops boycotted, Jews maltreated and deported and Jewish doctors, officials and professional men deprived of their livelihood. Enormous numbers of refugees including scholars, scientists and famous international figures such as Einstein, Feuchtwanger and Bruno Walter fled into neighbouring countries. Some 20,000 took up residence in France, 8,000 in Holland and thousands in Czechoslovakia, Poland, Belgium and other countries including 1500 in Great Britain.

One cause of the campaign was an attempt to alleviate heavy unemployment by filling the positions of displaced Jews from the ranks of unemployed supporters of the régime.

Extensive public protests were held throughout the world, notably by the Jewish community in England, and the Jews of the United States

**Antiseptics.** An antiseptic substance may be defined as one that inhibits the growth of micro-organisms, both animal and vegetable, but does not necessarily kill them. Substances that perform the latter function are termed disinfectants, but in popular usage there is considerable confusion between the two terms, a state of affairs that is complicated by the fact that many substances can act both as antiseptics and disinfectants, depending upon the concentration that is employed. Extremely little is known of the mode of action of antiseptics, and their classification is best made according to chemical composition and mode of usage. The science of the study of internal antiseptics is *chemotherapy* (*q.v.*) There are three principal classes of antiseptics, intended (1) for general uses, (2) for internal use against bacterial infections, and (3) for internal use against protozoal infections.

The first used antiseptic was *phenol*, which is obtained from coal-tar, this substance, however, is toxic, and is rapidly falling out of use. Derivatives of phenol do not, however, suffer from the same disadvantages, and there are several that are in considerable use.

*Lysol*, for instance, is an emulsion of cresol (methyl-phenol) with soap and water. The cresol used is a mixture of three isomeric forms, *meta*-, *para*-, and *ortho*-cresol. Hexylresorcinol has a very high phenol coefficient (50), and is used as a urinary antiseptic under the name of "Capricol." Like all phenols, however, it may only be used with an acid urine. Other phenolic antiseptics are *Thymol* (isopropyl *meta*-cresol) and  *$\beta$ -naphthol*. Thymol is also widely used as an anthelmintic. Alcohols find a certain use as skin disinfectants, but they tend to dehydrate the skin somewhat.

Of the halogens iodine is the only one used as an antiseptic, since the lower members are far too toxic

Iodine in the form of an alcoholic solution is very widely used. Iodoform, the iodine compound corresponding to chloroform, is also employed to a small extent. Derivatives of chlorine are, however, much employed, the most popular being hypochlorous acid, which is used in many branded antiseptics. The antiseptic action is believed to be due to the reaction of the acid with bacterial proteins resulting in the formation of chloramines. These latter are themselves considerably used as antiseptics, *Chloramine-T* (Sodium *p*-toluenesulphonchloramine) which is made from a saccharine by-product is such a one.

*Dakin's solution* consists of sodium hypochlorite with about  $\frac{1}{2}$  per cent of boric acid.

A class of antiseptics that have been introduced only recently, but have very rapidly increased in favour, are synthetic dyestuffs. Owing to their dyeing capabilities they are very rapidly absorbed by organic materials, and their antiseptic properties are probably in a large measure due to this fact. The first dye to be used in this capacity was malachite green, which is, however, no longer thus employed. The principal dyes used to-day as antiseptics are acriflavine (*q.v.*), auramine, and the dyestuffs derived from acridine.

For the treatment of trypanosomiasis several synthetic organic products have been manufactured. Some azo-dyes also have a beneficial effect, especially in cattle. Numerous organo-metallic compounds have been used with some measure of success as specifics against various diseases; they are dealt with under the headings of the metallic element contained.

Of the alkaloids (*q.v.*) the highest chemotherapeutical power is possessed by quinine, which is a general protozoal poison, it is used with great success as a specific against malaria. The only synthetic quinine substitute that has so far given satisfactory results is *Plasmaquin*. The action of hydnocarpus oils against leprosy is discussed

# Antisthenes

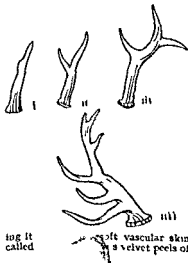
in the article OILS FATS AND WAXES  
See also DISINFECTANTS

**Antisthenes** [AN TIS THE NEE] (c 440-365 B.C.) Athenian philosopher and founder of the Cynic school after being at first an ardent disciple of Socrates. His teaching was simple, it being that virtue consisted in complete self-denial. Antisthenes practised it by living as a beggar. His philosophy attracted the poor and uneducated and commanded considerable influence.

**Antistrophe** [ANTI STRŌFI or ANTI STRŌFI] see STROPHE

**Antithesis** [ANTI THESIS] a term given to the literary device of emphasising and pointing contrasts by the opposition of different words or expressions e.g. Render to Caesar the things that are Caesar's and unto God the things that are God's.

**Antler** the horn of the deer family. When fully developed it consists of solid bone not covered by hairy skin or a horny sheath. It further differs from the horns of giraffes, sheep, antelopes and cattle in being periodically, generally annually, shed and replaced by a new antler which is covered dur-



ing it called

# 41

# Antofagasta

when the antler has reached its full size. An antler may consist of a single spike but it is usually armed with branches called tines. These contrary to the usual belief are not necessarily added to the antler at the rate of one per year even in the English Red Deer.

Nos. I, II and III show stages of development to the full point head of No. IV in the diagram in col. 1.

**Antlion** is the larval form of an insect related to the dragon flies. It owes its name to its habit of im-



Ant Lion Larva.

bush nights. After making a conical pit about 3 in. wide at the top and 9 in. deep in loose sand it buries itself at the bottom with only its head showing. When a small insect slips over the loose sand on the edge and falls to the bottom it is seized or if it attempts to scramble out the antlion jerks sand at it with its head thus causing it to fall back into the pit. The body of the insect after it has been sucked dry is similarly jerked out of the pit. The antlion passes through its pupal stage in the sand beneath its pit and on emerging resembles a dragon fly. Some species do not make a pitfall. The larva is known as the doodle bug in America and the term antlion is sometimes applied to the adult insect which is represented by several species in the temperate and tropical regions of the E. and W. hemispheres.

**Antofagasta** (1) Province of Chile included in Atacama Desert borax nitrates common salt silver copper formerly Bolivian ceded to Chile 1843 Area 47,300 sq. m. pop. 178,800 ( ) Port N. Chile capital of (1) Situated



about 750 m N of Valparaíso Silver smelting, exports alkalis, silver, copper Terminus of railway into Bolivia Pop 53,600

**Antonelli, Giacomo** (1807-1876), Italian cardinal, under Pope Pius IX led the constitutional ministry of 1848 After fleeing with the Pope to Gaeta on the ministry's downfall, he returned to exert a varying influence in State affairs, and organised the defence of the Vatican territory against Garibaldi in 1867

**Antonello da Messina** (1430-1479), Italian painter, three of whose works (including *St Jerome in his Study*) are in the National Gallery, London, acquired from Jan Van Eyck the characteristic Flemish love of detail in his paintings His portrait studies still hang in many galleries, one of the most notable being the portrait of an unknown man, in the Berlin Museum

**Antoninus Pius** (A D 86-161), an enlightened Roman emperor, succeeded Hadrian in 138 He encouraged arts and sciences, social reform and political leniency He adopted Marcus Aurelius (*q v*) who became his successor

**Antoninus, Wall of**, built for Emperor Antoninus Pius, extending from the Firth of Forth to the Firth of Clyde, to serve as a N fortification It is sometimes called Agricola's Wall

**Antonius, Marcus** (*Mark Antony*) (c 83-30 B C), the Triumvir, was grandson of Marcus Antonius, the Roman orator, and related to Julius Cæsar With Cæsar in Gaul (54 B C), he was made quæstor, augur, and tribune (*qq v*) of the plebs, he deputised for the Dictator in Italy during Cæsar's absence in A D 47 and 49, and although a brief quarrel between them arose, Antonius was Consul in 44 and earned popular support by his famous oration after the death of Cæsar Determined to make himself ruler, Antonius found opposition from Cæsar's adopted son Octavian, who, with the support of the senate and Cicero, overthrew Antonius and was granted the consulship Antonius

joined forces with Lepidus in Cisalpine Gaul, marched on Rome, and the three leaders came to terms as joint rulers Gaul going to Antonius, Spain to Lepidus and Africa, Sardinia, and Sicily to Octavian. Ruthless suppression of conspirators followed, even Cicero not escaping, and in 42 the republican and senatorial opposition was routed

In later travels Antonius spent long periods with Cleopatra, but by extravagant distributions of territory during succeeding years, when the term of the triumvirate was extended he forfeited influence The senate removed him from office in 32, and declared war on Cleopatra. Antonius was defeated in the following year, fled after Cleopatra into Egypt, and there committed suicide

**Antony of Padua, St** (1195-1231), Franciscan missionary, born at Lisbon, preached in Italy, and the S of France, and was an active worker for his order, many miracles being laid to his account He died at Padua in 1231, and was canonised by Gregory IX in the following year Commonly represented in art holding the Infant Jesus in his arms Feast, June 13

**Antrim** (1) County of Ulster, Northern Ireland, between co London derry (W) and co Down (S) There are fine basaltic cliffs on the N coast (Giant's Causeway), Fair Head is a striking headland in the NE The SW of the county is occupied by Lough Neagh

Flax, oats, and potatoes are grown, and fresh-water fishing is of some economic importance Minerals include iron, rock salt, bauxite, and

a little



Antrim A Round Tower

## Ants

## 247

## Antwerp

coal Chief industrial towns are Belfast Lisburn and Ballymena The linen industry was stimulated by Huguenot *émigrés* shipbuilding is the principal industry (on Belfast Lough) Larne is a packet station Area 1099 sq m pop 191 670

(2) County town of co Antrim a market town situated N E of Lough Neagh Manufactures paper and textiles Pop c 1950

Ants stinging and biting insects of the order *Hymenoptera* distinguished by their elbowed antennae and the conversion of at least the first abdominal segment into a narrow stalk They are remarkable for the high elaboration of instincts subservient to social life They are found all over the world outside the polar regions and between three and four thousand distinct kinds have been discovered differing not only in structure but in habits and in the extent to which the individuals composing a colony may be modified in various ways but all the variants are derived from one or the other of the three primary kinds found in all colonies the male the female or queen and the worker

Typically the male is winged and has well-developed antennae but imperfect jaws the queen is larger than the male and has well-developed jaws and a swollen abdomen the worker a female normally sterile is smaller than the queen and is wingless There may be more than one kind of worker in a colony a well known type being the soldier distinguished by its large head and powerful jaws

Sometimes however males may resemble queens or *vice versa* and both may be wingless and resemble workers There seems indeed to be every intermediate stage in some colonies between the three fundamental types It has been found that if a colony is deprived of its queen her place is taken by a worker and it is believed that under the influence of stimulating food workers if required can be rendered fertile

Like bees ants in which both fertile sexes are workers in a nuptial

flight at breeding time sometimes in such numbers as to darken the sky On coming to the ground the fertilised female loses her wings buries herself lays her eggs in the burrow and feeds the first larva on her own saliva On reaching maturity these worker ants make their way to the surface and forage for food upon which they feed the queen who continues egg laying for a dozen or more years

The number of ants in one community may be 50 000 or more and the nests consist of galleries and of chambers used as nurseries and granaries According to the species the nests may be entirely underground or visible on the surface as mounds formed of excavated earth or specially collected pine needles or other debris Some kinds of ants raid the nests of others steal their cocoons and make slaves of the workers when they emerge

Many ants called harvesting ants lay up stores of seeds in their nests Others known as fungus ants make fungus gardens growing the edible fungi on beds of decaying leaves Others keep in their nests various insects such as plant lice or aphides (green fly) for the sweet juices they exude The nests are however often occupied by alien insects of a great many different kinds and the relation between these and the ants is not always understood

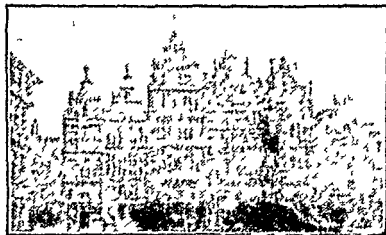
Antwerp (Fr *Amers*) (1) Capital of the province of that name and



Ants (from 24)  
(1) Male  
(2) Queen  
(3) Worker

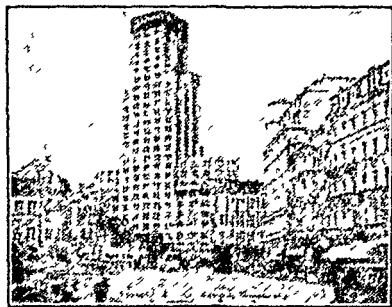
commercial capital of Belgium, on the right bank of the Scheldt, and separated from the open sea by the Dutch frontier. The town is heavily fortified.

**Commerce** The modern commercial expansion of Antwerp dates from 1863, when the city bought from the Dutch



Antwerp 16th cent Guild Houses in Grand Place.

the rights of toll on traffic entering the Scheldt. As it is the natural port of the middle region of W Europe, and particularly of industrial Belgium, its commerce increased steadily until 1914. After a temporary decline due to the World War, Antwerp recovered rapidly and by 1932 some 20,000,000 tons of



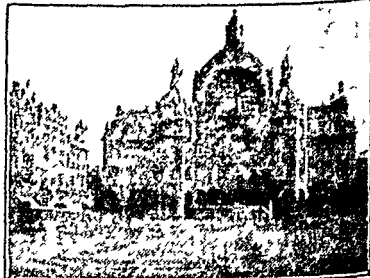
Antwerp Modern Buildings

shipping annually were entering the port. Pop 284,800.

**Public Buildings** Antwerp is a handsome modern city with some memorials of the commercial eminence of the past. There are a number of fine docks and nearly 30 m of quays. The most striking architectural feature

is the mediæval cathedral (14-16th cent) containing some of the masterpieces of Rubens, whose tomb is in the church of St James. Many works of the Flemish masters are housed in a fine modern picture gallery.

**History** At the close of the Middle Ages Antwerp supplanted Bruges as the commercial metropolis of N W Europe, reaching the peak of prosperity in the middle of the 16th cent. The Antwerp money-market dominated European finance at that time to much the same degree that modern London has since influenced world finance. Spanish conquests in 1576 and 1585 damaged the city's prosperity, and the ruin was consummated by the Treaty of Westphalia (1648), which closed the



Antwerp Central Station

Scheldt to commerce. In September 1914 Antwerp was invested by the German forces and captured from the Belgian Field Army and the British Naval Division after a severe bombardment on Oct 10.

(2) Province of NE Belgium, a flat agricultural district growing chiefly flax and cereals. The chief towns are Antwerp, Malines, and Turnhout. Area, 1100 sq m; pop (1931) 1,190,000.

**Antwerp, Siege of (Sept -Oct. 1914)** After the initial failure of the Germans to gain a quick victory in the World War, they made a second attack directed towards the W coast of Belgium. After a severe German bombardment, the Belgians evacuated Antwerp. Its loss was a severe blow to

the Allies as it provided the Germans with a convenient base but the delay occasioned by the siege allowed Allied reinforcements to arrive and possibly prevented the loss of Calais.

**Ann**, a deity worshipped in Babylon described as the supreme king of the heavenly spirits.

**Anubis**, a god of the ancient Egyptians the supposed son of Osiris (*qv*). He was believed to lead the dead to the underworld and there judge them. The Greeks identified him with Hermes (*qv*).

**Anvil**, a heavy block of iron employed by smiths and other workers in metal as a support for material to be hammered. The term is also used in the case of steam hammers where the anvil is supported by an anvil block consisting of a very large mass of iron.

**Anxiety Neuroses**, *see* **PSYCHO-ANALYSIS**.

**Anzac**, a name formed of the initials of the Australian and New Zealand Army Corps. The Anzacs served in the World War taking a prominent part in the landing at Gallipoli (April 25 1915) the battle of the Somme 1916 and in the campaigns against the Turks in Macedonia Salonika Egypt and Palestine.

**Aosta**, Piedmontese town situated at the convergence of the routes S from the Great and Little St Bernard passes in the Val d'Aosta some 1000 ft above the sea. A railway runs from here to Turin. There is a handsome cathedral dating from the 11th cent. Birthplace of Anselm (*qv*).

**Apache** (1) Name of warlike tribe of Red Indians (*qv*). (2) Italian rough robber and assassin.

**Apatite**, phosphate of calcium with a small percentage of chloride or fluoride. May occur as crystals nodules or masses interbedded with other rocks generally being associated with crystalline limestones gneisses or granites. It is sometimes colourless but usually reddish brown or green and is sometimes called rhubarb stone. A yellow variety is termed *Asparagus*

stone. It is of economic importance as a fertiliser of soils.

**Ape** *see* **ANTHROPOID APES**.

**Apelles** (AP-EL-LEE) Cr. painter (4th cent. B.C.) considered the finest of antiquity famed for his portraits of Alexander the Great. None of his works is extant.

**Apennines** The a mountain chain forming the backbone of the Italian peninsula running from S.E. from Col d'Altare to the neighbourhood of Ancona and thence S.W. parallel and close to the Adriatic coast. Length c. 800 m. greatest breadth c. 75 m. The Apennines are usually divided into the following groups from N. to S. the Ligurian Tuscan and Umbrian Apennines forming the N. section a central section consisting of three parallel ranges which includes the mountains of the Abruzzi and the S. Apennines where the chain becomes broken up into numerous minor ranges.

The Apennines belong to the Alpine Himalaya system of folding although their precise relation to the parent chain is debatable. The covering rocks are chiefly limestones and conglomerates (*qv*) and are related to the flanking ranges of the Alps. Older rocks appear in Calabria. The S. section appears to have been elevated in a more recent geological epoch there is still volcanic activity (Etna in Sicily Vesuvius near Naples) and violent earthquakes occur. The central chain includes a number of extinct volcanoes the craters of which are sometimes occupied by lakes (Trasimeno Bolsena Albano).

The mountains are for the most part a well marked chain filling the interior of the peninsula with an average elevation of c. 4000 ft. and separating the plain of Lombardy the Adriatic coast plain and the lowlands of Apulia to the N. and E. from the plains of Etruria Latium and Campania to the S. and W. The loftiest part of the chain is in the mountains of the Abruzzi W. of Rome (Gran Sasso d'Italia 9600 ft). The water parting lies nearer to the E. than to the W.

side of Italy, and the principal rivers, the Arno, Tiber, and Gavigliano, run S and W

The most important passes lead from Tuscany into Lombardy and from Genoa to Turin. The Roman roads leading from Rome to the N provinces crossed these passes, and they have been succeeded by the modern railways, of which the most important lines run from Savona to Turin, from Florence via Pistoia to Bologna, and from Florence to Faenza. The chief line of communication through the Central Apennines crosses the mountains from Rome, by way of Foligno, to Ancona.

The lower slopes of the Apennines are less well forested than formerly and reforestation has been attempted. Wolves are still to be found in the remoter parts of the range, a source of danger to the flocks which graze on the high pastures. Snow lies upon the highest summits during most of the year, but there are no glaciers. Minerals (except Carrara marble) are not important.

**Apertments**, see MEDICINES, HOME.

**Apéritifs** [AP-Ā'-RI-TĒR] (or *appetisers*), alcoholic drinks consumed before a meal to stimulate the appetite. The best-known examples are vermouth and bitters. These, in combination with other ingredients, are called cocktails (*qv*).

*Vermouths* are made from white wines to which further alcohol and aromatic substances have been added. They are exposed to the sun's rays for 1-2 years, and their alcoholic strength when sold is about 17 per cent. Italian vermouths are usually sweet and French dry.

*Bitters* are alcoholic beverages containing some bitter ingredient to stimulate the appetite and some flavouring to make them palatable. The alcoholic strength is about the same as that of whisky, brandy, and gin (40 per cent). Most of the bitter substances added are medicinal: gentian, quassia, cascarilla, quinine, cinchona, rhubarb, angostura, bitter

orange rind is sometimes used. The flavourings include such substances as cinnamon, caraway, and cloves.

**Aphelion**, see SOLAR SYSTEM.

**Aphis**, species of garden louse infesting various plants. Greenfly, the bane of the rose-grower, can be combated by syringing with insecticide or soapy water to which a small quantity of paraffin is added. Pyrethrin and tobacco powders are also used to prevent attack. Blackfly infests the tops of broad and runner beans, and can be got rid of by pinching off the tops of the plants, which have no productive use. (For Woolly Aphis, see AMERICAN BLIGHT) See also GREENFLY.

**Aphorism**, strictly and originally a brief definition or statement of principle in some particular science or art, hence generally a maxim or proverbial saying.

**Aphrodite** [AF-RO-DI'-TĒ], the Greek goddess of love and beauty, counterpart of the Roman Venus. Primarily a goddess of fruitfulness, though various attributes have been claimed for her, including an association with the sea as a marine divinity, and even a protective connection with war. She had the power of imparting beauty to others, and was considered a patroness not only of marriage, but also of love in the widest sense.

**Apiculture**, see BEEKEEPING.

**Apis**, at first the name given to a sacred bull in the Egyptian temple of Ptah. Later he was regarded as a god represented by the bull and then as an incarnation of Osiris (*qv*).

**Apocalypse** [APOK'ALIPS], the name (Greek) given to the last book of the New Testament, called in English the Revelation of St John the Divine (*qv*). The word is also used of a number of late Jewish and early Christian mystical writings prophesying the future, of which the Book of Daniel in the Old Testament is an example.

**Apocrypha**, the name given to certain books of the Bible which are not admitted by the Jews or the Protest-

ant churches as authoritatively establishing a doctrine though in the Vulgate (*qz*) and consequently by Roman Catholics the majority of them are regarded as canonical. A number of other pseudo-inspired writings dealing frequently with the childhood and infancy of Christ are also called by this name they are not allowed on any hand as having any religious authority.

The books of the Apocrypha are I and II Esdras Tobit Judith The Rest of Esther The Wisdom of Solomon Ecclesiasticus Baruch with the Epistle of Jeremiah The Song of the Three Holy Children The History of Susanna Bel and the Dragon The Prayer of Manasses and I and II Maccabees.

**Apocynaceae** a natural family of trees and shrubs producing certain kinds of rubbers seeds and woods used in commerce Represented in the hot house by the allamandas neriums and mandevillas.

**Apocrypha** see **ARTS**

**Apollinaris**, 4th cent bishop of Laodicea in Syria he denied the human element in Christ's nature thus founding the heresy of *Apollinarianism*.

**Apollo** (AR-OL-Ō) Greek god of light

and of the sun of song and music prophecy medicine and athletic prowess son of Zeus and Leto born on the floating and barren rock of Delos which immediately afterwards became firm and fertile. Apollo was also a god of agriculture and of animals.



Apollo di Belvedere (Vatican Museum)

**Apollodorus** (AP-OL-Ō DŌR-ŌS)

Athenian painter of the 5th cent B.C.

**Apollonius of Perga** Greek mathematician of the 3rd cent B.C. recognised on account of his works on conics as one of the originators of mathematical science.

**Apollonius of Tyana**, Greek philosopher and follower of Pythagoras was born just before the Christian era. He travelled widely in Asia Minor and India and on his return was regarded as a magician. He made further voyages in Spain Italy and Greece and later established a school at Ephesus where he taught till his death at the age of nearly 100. His *Life* written by Philostratus is largely apocryphal.

**Apologetics**, the branch of theology concerned with the defence of Christianity as a religion revealed by God. In England to-day Christian Evidences is a word used as synonymous.

**Apologue** a fable related with special application to the circumstances of a case in point as that of the belly and the members in Shakespeare's *Coriolanus*.

**Apomorphine**, an alkaloid derived from morphine by acting on the latter with a dehydrating agent and removing a molecule of water. Apomorphine in the form of its hydrochloride is medicinally important as being the most powerful emetic known. It acts not on the stomach but indirectly by stimulating the vomiting centre in the medulla. It is given by injection and its action is extremely rapid.

**Aponogeton** A hardy perennial aquatic plant with habits of the water lily and requiring similar culture. Bears white flowers with scent of hawthorn. *Aponogeton distachyon* is the most reliable species.

**Apophthegm** (AP-ŌF-THĒM) (or *Apophthegm*) a brief sententious utterance a maxim or terse proverbial saying.

**Apoplexy** (or *Stroke*) a sudden loss of consciousness and power of voluntary movement due to the rupture of an artery in the brain or to a blockage of such artery by an embolus. Burst of the artery is caused by a local weak-

treatment are most essential, because the condition tends to lead to serious complications. The appendix abscess may burst and give rise to rapidly spreading fatal peritonitis (see APPENDIX). Treatment consists in removal of the organ, and, if necessary, the abscess cavity.

A study of large numbers of inflamed appendices has shown that in many of them the condition is solely one of bacterial infection of the appendix wall. This fact is contrary to what is popularly imagined as being the cause, namely, the lodging in the appendix of a cherry stone or other solid particle. There are, however, occasional cases where the cavity of the appendix is obstructed, and in point of fact, these cases may lead to gangrene and peritonitis with much more ease and rapidity than the other type.

**Appendix, see BOWELS**

**Appenzell:** (1) Small Swiss canton S.E. of Lake Constance, divided into two administrative districts—Inner Rhoden (capital Appenzell) and Outer Rhoden (capital Trogen). The former is almost entirely pastoral and agricultural. Inhabitants are Roman Catholic and German-speaking. Area, 185 sq. m., pop. (1930) 63,000. (2) Small Swiss town of some antiquity. There is a local embroidery industry, and a market for dairy produce. Pop. c. 5000.

**Appian Way, or Via Appia,** probably the earliest military road, constructed by Appius Claudius Cæcus (q.v.) in 4th cent. B.C. It ran from Rome to Capua, a distance of 132 m., but was later extended to reach more distant parts. Much of it has survived to this day. During the early part of the 18th cent. was built the New Appian Way, from Rome to Albano. Under the Mussolini administration stretches of the ancient road were laid bare as part of a general scheme for the restoration of ancient monuments.

**Apple.** The apple is the most useful and the most extensively grown of all hardy fruits. Varieties are very numerous, 1496 having been recorded

in 1808 and many more developed since that time. The apple in its wild state exists in most countries of Europe and is here known as the crab apple. Apple trees are adapted to various forms of culture. For large orchards standards were formerly favoured, with small bush fruits, such as gooseberries and currants, growing between them, but modern growers find that bush and pyramid trees are the most profitable. These may be planted 9 ft. apart each way, requiring 937 plants per acre, and bush fruits, such as currants and gooseberries, may be planted 6 ft. from each other between the rows.

**Standards** are often very useful, if only for effect. *Lspaliers* (q.v.) may be planted from 8 to 24 ft. apart. Usually they are planted 3 or 4 ft. from the walls, leaving a border for flowers grown for cutting, and vegetables are grown behind. **Cordons** are trees trained horizontally with a single stem.

**Planting.** The earlier the trees can be planted after the leaves fall the better, but planting can be done up to the end of March. The ground must be prepared by trenching and manuring. Trees of any size will require have some of the roots shortened back and any roots that have been broken in digging up the trees should be cut off clean. The hole should be made wide with a flat bottom, and the roots spread out evenly and the soil worked well among them. Care should be taken to prevent the roots from getting dry, as the fibrous and most useful roots soon perish if exposed. The liberal use of lime on the surface is beneficial and helps to eradicate vermin.

**Pruning** is an important operation, especially in the formation of young trees. It is essential to make clean cuts close above the wood buds. Winter pruning should be done as soon as possible after leaf fall. Summer pruning is sometimes recommended, but should be done with considerable care and not too late in the season. Some of the surplus

## Apple

## 201

## Apple

growths may be cut away about July and shoots shortened back may form flowering spurs. When done too late only soft unripened growths are made and these are of no use either for fruiting or for making the trees.

**Gathering Apples.** Appearances are often deceptive. One of the best tests for ripeness is to examine the seeds of one or two when these are dark brown or nearly black the apples will be ripe enough to gather. If gathered before they are ripe they tend to shrivel and if they are not falling off the trees it is often better to leave them for some time especially if they are to be kept.

**Storage.** Clean dry straw or perfectly dry clean boxes lined with clean paper should be used. No printed paper should be employed and nothing likely to affect the flavour should come in contact with apples. A dry cellar or a cupboard not affected by outside changes of temperature should be used as a storage chamber. Apples are easily bruised and decay sets in and one decayed apple left among sound fruit will soon cause them all to decay.

**Storage on a Commercial Scale.** Much research on this subject has been carried out in the last few years and very striking results obtained so that now by careful regulation of temperature and gas control of the chambers apples may be maintained in perfect condition during transit and storage.

**Varieties.** *Dessert* July-Aug. Beauty of Bath Juneating White Juneating Red Mr Gladstone Aug-Sept. Devonshire Quarrenden Worcester Pearmain Langley Pippin Sept-Oct. September Beauty Cornish Aromatic King's Acre Pippin Oct-Nov. Scarlet Nonpareil Ribston Pippin Blenheim Orange Nov-Jan. Cox's Orange Pippin Christmas Pearmain Charles Ross Gravenstein Jan-March. Boston Russet Lord Hindlip Claygate Pearmain March-May. Tverlasting Fearn's Burghley *Cooking*

Lord Suffield Keswick Codlin Peasgood's Nonsuch Bismarck Tower of Glamis Bramley's Seedling Lord Derby

**Blossom Wilt.** A fungus having attacked the blossom passes down the branch thus causing the leaves which surround the flower to droop and in bad years may kill the fruiting spurs thus seriously damaging the trees for several years. The disease is easily recognised and the only successful treatment is to remove every infected branch. This should be done in summer.

**Blossom Weevil** is a very serious pest in S. England occurring to a greater or lesser extent over the whole of the British Isles causing apple blossom to die before opening and sometimes destroying a very high proportion of the blooms. The adult beetle is black or brownish about  $\frac{1}{2}$  in in length. The female lays eggs in holes bored in the unopened flower bud depositing one egg in each bud each female laying 40 or more eggs. If the flower should expand rapidly in favourable weather before the egg hatches the grub dies. Usually the pale-yellowish grub appears first and lies in a curved position within the unexpanded or capped bud. In a fortnight it is full grown and enters the pupal stage for some ten days. Then the adult weevil eats its way out through a hole in the side of the blossom and seeks winter quarters under dead leaves or in crannies in the bark.

Control is made extremely difficult by the insects mode of life but the number of weevils in infested orchards can be reduced by burning rubbish cultivation of the ground under trees or most successfully by trapping the weevils as they seek winter quarters by tying bands of sacking round the trunks and spraying these with a 10 per cent tar-distillate wash. *See also* PEAK LEAF BLISTER MITE.

**Muscel Scale** can become a serious pest but is usually kept in check where regular spraying such as lime-sulphur against apple scab is customary.



Tiny, brown, mussel-like scales are found on the bark, and occasionally on the leaves of infected trees, and beneath these are eggs in winter and a living insect in summer. The eggs hatch at the end of May into very small wingless insects, which crawl out from beneath the scale, and wander on the bark for three or four days. During this period they may be carried to other trees. The larva drives its "trunk" into the bark, and sucks up sap, then, losing all power of movement, forms a scale beneath which it lives, which increases in size at the same rate as itself. The mussel scale insects are almost all females, and these lay eggs, usually without male intervention, each laying some 80 eggs before dying at the end of the summer. Badly infected trees should be sprayed in winter with a tar-distillate wash.

Appleby, municipal borough and county town of Westmorland, situated near R. Eden at the foot of Dufton Fells, formerly important as a border stronghold. Norman keep. Pop. c. 1700.

Apple Charlotte, to make

- 1½ lb apples
- 1½ gills breadcrumbs
- 4 oz moist sugar (or 2 tablespoonfuls syrup and 2 oz sugar)
- 1 tablespoonful lemon juice
- 1 tablespoonful water

Grease piedish and sprinkle with crumbs. Peel and slice the apples, and place in layers, alternating with sugar and breadcrumbs. Heat syrup with water and add lemon-juice. Pour over mixture in piedish. Bake 1-1½ hours in a moderate oven (350° F). Apricots may be used instead of apples.

Appliqué, work in which one material forming the design is applied on to another forming the background. This work is usually carried out in leather (*see* LEATHERWORK) or in fabrics.

Almost any material may be used for appliqué, though for the background one which has no pile is advised. If the fabric to be applied is likely to

fray, the wrong side may have a thin layer of any good white paste spread over it. This process is not advised.

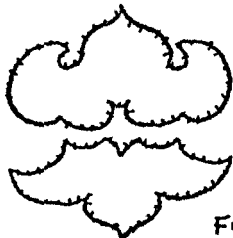


Fig 1

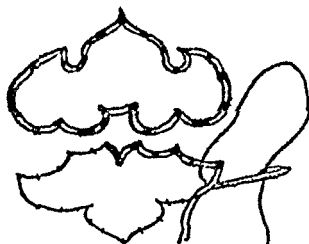


Fig 5

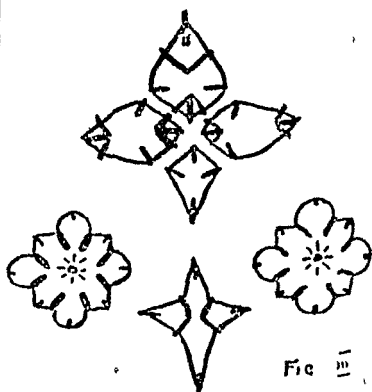


Fig 3

Appliqué

with any other delicate fabric, but it does no harm to linen, cretonne, etc. The design having been cut out and

pasted is then tacked on to the back ground and sewn down absolutely smoothly (see Fig 1). The edge is then completely hidden by some simple embroidery stitch e.g. couching (see Fig 2) or sateen chain or button hole stitches.

Appliqué can also be worked in felt. In this it is not necessary to stitch the applied parts on first and then embedder over them; instead the pattern can be held in place by means of fancy stitches which help in the design (Fig 3).

**Appointment** Power of, an authority given by one person the donor to another person the donee to deal with or dispose of either absolutely or partially and for the benefit of the donor or some other person property which is not in the absolute ownership of the donee e.g. a testator may authorise his executors to distribute his property among certain persons in such shares as the executors think fit.

**Apponyi** [of pov vz] **Albert Count** (1846-1933) Hungarian statesman entered politics as a Liberal Catholic later leading the Conservative Party in opposition until he himself took office in 1900. He was Minister of Education and president of the Hungarian Party of Independence and after the World War was an influential delegate at the 1914 and 1915 Assemblies of the League of Nations.

**Apportionment**, a division of a whole into parts proportioned to the rights of two or more claimants. It may be (a) in respect of time at Common Law this was not recognised so that when a successor in interest succeeded just before a rent or other periodical payment fell due he took the whole. Since 1800 all rents and periodical payments in the nature of income are considered as accruing from day to day and apportioned accordingly. (b) in respect of estates e.g. where part of premises held on lease is destroyed by an inundation a proportionate amount may be

deducted from the rent payable to the landlord.

**Apposition** (gram.) a term applied to the syntactical device whereby one noun or its equivalent is made to limit or define the meaning of another noun or its equivalent e.g. It was *Smith* I spoke to that man over there (where *Smith* and *man* are in apposition).

**Appraisal** valuation of property by a professional valuer.

**Apprentice** one who is contracted to a master giving his services in return for instruction in a trade or profession. Formerly under the Guild system apprenticeship was the rule in all trades but the Industrial Revolution brought in a great influx of non-skilled labour and swept away the system which now only survives in a few special cases. Usually a premium is payable for the privilege of apprenticeship.

**Appropriation** (law) the setting aside of money or property for a particular purpose. Thus at the end of each session of Parliament a Bill called an *Appropriation Bill* is passed authorising the Treasury to pay out sums voted for specific purposes during the session.

**Approved Society** see NATIONAL INSURANCE.

**Approver** in law a person indicted for a crime who has confessed his guilt and has been admitted by the court to give evidence on oath against his accomplices. Such action is termed turning king's evidence.

**Appurtenances**, in law rights or property attached to other property e.g. a right of fishing a garden an outhouse etc.

**Apricot** (*Prunus armeniaca*) a tree belonging to the family Rosaceae and a native of temperate Asia flourishes on sunny sites especially trained to a wall also in greenhouses. Good loam with a mixture of lime and rotted leafmould at planting time is the ideal soil. Pruning consists chiefly in training shoots to the wall stopping all leading shoots and pinching right out all

monarchy from the 7th to the 14th cents. After the fall of the Roman Empire, a corporate feeling, almost of nationality, arose among the Aquitanians, on whom, in spite of partial Visigoth and Frankish conquests, Teutonic institutions made less impression than on the rest of Gaul. The dukes of Aquitaine, originally perhaps Frankish viceroys, availed themselves of local feeling to advance their feudal power, and in spite of a vigorous assertion of authority by Charles Martel and Charlemagne in the 8th cent., became practically independent of the French monarchs. In 1152 the heiress to the duchy married Henry Plantagenet, later Henry II of England, and for 300 years the English held a footing in S W France. The Plantagenet rulers, like their predecessors, used Aquitanian sentiment to push their dynastic interests, and the recovery of Aquitaine in the later stages of the Hundred Years' War was among the greatest services of the French monarchy to French nationalism. The last Plantagenet stronghold, Bordeaux, fell in 1453.

**Arabesque**, a certain type of ornamentation. The word actually means Arabian, but the type of decoration that it is used to describe was employed in Greek and Roman times, as can be seen in the remains of Pompeii and the ancient buildings of the Roman empire. The Italian 15th-century artists revived and elaborated the principle, and the term is now most frequently used to describe the intertwining patterns of the book-borders, metal-work, sculptural and pictorial decorations of the period. The commonest type is composed of twining scrolls or conventional foliage or flowers, symmetrically ornamented with human figures, birds, or animals. The Vatican arabesques designed by Raphael are the most famous examples in painting, while fine sculptural work of this kind exists in the church of Santa Maria dei Miracoli at Padua.

**Arabia** (Arabic *Jazīrat-al-Arab*), a rectangular peninsula of S W. Asia, separated from Africa on the W. by

the Red Sea and the Isthmus of Suez, and from Persia on the E. by the Persian Gulf and the Gulf of Oman; Palestine, Transjordan, and the kingdom of Iraq are on the N.W and N, and the Gulf of Aden and the Arabian Sea on the S. Length, *c* 1400 m, mean breadth, *c* 800 m, area, over 1,100,000 sq m.

**Political Divisions** The kingdom of Saudi Arabia includes the Hejaz, Nejd, and its dependencies, and stretches from the Red Sea to the Persian Gulf. The Imam of the Yemen rules over the district in the S W corner as far N as 17° 30', excluding the Aden Protectorate, the district of Aden (*qv*), and the Hadramaut, which are in various degrees under British control. The Sultan of Muscat rules over the district of Oman in the S E corner of the peninsula. The Sheikh of Kuwait is ruler of a small independent State in the N E on the coast of the Persian Gulf, his Government is subsidised by Great Britain.

**Geology** Arabia is geologically a continuation of the Egyptian table land, from which it is separated by the deep fault containing the Red Sea. An extensive lava flow has protected the underlying sedimentary rocks of the peninsula from weathering, hence its remarkably even surface. The coast range in the W, marking the E limit of the Red Sea fault, shows evidence of volcanic activity in the near past.

**Relief** The peninsula is a vast plateau sloping down from W. to E., tilted up at the S W corner. The W. edge of the plateau rises to a considerable mountain range with a mean height of some 5000 ft, reaching *c*. 9000 ft in the Yemen. Between the mountains and the Red Sea is a narrow coast plain with an average width of 20 m. The even structure of the peninsula is broken in the S E. corner by the Jebel Akhdar range (reaching 10,000 ft.) in the district of Oman. Owing to the comparative lack of rainfall rivers are few and intermittent.

**Climate and Deserts** A certain amount of rain, usually in monsoon

torrents falls in the coastal regions where the valleys are often fertile. But the influence of the monsoon is not deeply felt in Arabia and the interior is almost wholly a rainless desert. The N (Nafud) and S (Rub Al Khali) Deserts are great sandy tracts completely arid, the central core of the peninsula is a hard gently folded desert whose valleys retain the scanty rainfall sufficiently to form a number of oases. The climate in general is very hot especially on the N part of the Red Sea coast but quite low temperatures with frost have been recorded in the N deserts in winter.

**Production.** Arabia is not at present of much economic importance. The steppe regions between the coast plains and the desert provide good grass and horses, camels, sheep, oxen and goats are bred. Dates are the most important fruit especially from the Batineh coast. N of Muscat coffee, gums, resin, grapes, cotton and sugar are cultivated in the coastal region; the best coffee berries are grown in the Yemen. Hides, clarified butter and dates are exported and rice and cotton-piece goods are the chief articles of consumption. Much of the external trade is with British India.

**Inhabitants.** The native Arabs are of Semitic race but on the W side there has been a considerable intermixture of negro blood from which even the Bedouin races are not apparently free. In Oman the mixture of races is even greater. Persians, Baluchis and Indians as well as negroes having mingled with the indigenous stock. There is still a considerable but declining Jewish element on the W and S.W. coasts and a marked Indian infiltration in the Red Sea ports. In social organisation Arabia is in a transitional stage between tribal and national civilisation. The unifying force is a common Mohammedanism. The coastal areas have a settled population and there is a very small settled element in the central oases. The deserts and steppes

nomadic tribes. Chief towns: Mecca (130 000) capital of Saudi Arabia; Jeddah the port of Mecca (40 000); Medina (30 000); Sana capital of Yemen (50 000); Muscat (45 000) and Matrah (8 000). Estimated pop. is as high as 10 000 000 but no reliable statistics exist.

**Communications** are still rather primitive but steadily improving. Trade is chiefly carried on by camel caravan or by sea. Such roads as exist are at best strips of metalling across the desert; most are mere camel tracks. The Hejaz Railway is connected with the system in Syria and Palestine and runs S to Medina from Amman but the S section is not now working. Since 1914 the Palestine Railway has administered the line down to Maan. There is a section of railway in the Aden district. Some progress has been made in motor transport across the desert.

**Exploration.** The interior of Arabia contains one of the largest areas yet unexplored by Europeans. As early as the 16th cent. an Italian adventurer visited Mecca. In 1761-4 Niebuhr explored a part of the Yemen and in the 19th cent. scientific exploration began. Wellsted visited Hadramaut and later explored Oman (1835). The great names in the exploration of the Hejaz and the N deserts are those of J. L. Burckhardt, Richard Burton and Charles Doughty. By the close of the cent. the topography of the Hejaz and Nejd had been practically cleared up. Halévy in 1869 amplified the early work of Niebuhr. The peninsula has only twice been traversed from sea to sea each time by the N route. In 1819 G. F. Sadler crossed from E to W on a political mission and a century later (1917-18) H. St. J. B. Philby repeated this feat. Among modern journeys may be mentioned those of Miss Gertrude Bell who travelled round the N extremity of the Nefud from Damascus; of Philby who crossed the Rub Al Khali in 1915.

him was purely circumstantial, but confessed after his conviction Aram is the subject of a poem by Hood and of a novel by Lytton

**Aramaic**, a member of the family of Semitic languages (*qv*), which was the language spoken in Palestine in the time of Jesus Christ

**Aran Islands**, group of low islands strung across the mouth of Galway Bay, geologically continuous with the denuded limestone of central Ireland and forming part of co Galway Inishmore (Aranmore) is the largest, others are Inishmaan and Inisheer Average elevation is 200-350 ft Area, *c* 18 sq m, pop *c* 1600

**Arapahoes**, *see* RED INDIANS

**Ararat**, double-peaked mountain rising above the Armenian plateau, the lower peak is 12,800 ft and the Great Ararat 17,300 ft above the sea The snowline is at 14,000 ft, and the névé beds of the Great Ararat are the source of the Rs Euphrates and Araxes The massif (*qv*) is of volcanic rock, which is continued in a long ridge to NW Tradition marks the higher summit as the resting-place of Noah's ark, and the neighbourhood is rich in legends connected with the Biblical story of the flood The peak was first ascended by Dr Parrott, a German (1829), and later by D W Freshfield (1868) and Lord Bryce (1876) *See* Lord Bryce, *Transcaucasia and Ararat*

**Aras** (*Araxes*), river of Asia Minor rising on the Armenian plateau near the source of the Euphrates, and flowing into the Caspian Sea to the E It has a rapid current, but is fordable when not in flood Length, *c* 600 m

**Araucaria** (*Norfolk Island Pine*), a very ornamental pine-like tree, with foliage in flat whorls up the stem, suited to warm greenhouse culture, or, in small sizes, as a room plant *Araucaria imbricata* is the familiar "Monkey Puzzle" tree of our gardens — a Chilean pine

**Arawaks**, *see* RED INDIANS

**Arbalest**, *see* CROSSBOW

**Arbela**, Battle of (331 BC), fought

near Gaugamela, when the Macedonians, under Alexander the Great, overthrew the Persians, under Darius Codomannus. It made Alexander master of Asia, and is one of Creasy's "Fifteen Decisive Battles of the World"

**Arbitrage** (econ), a system of buying in a market where the price of the article happens to be cheap, and selling at once in a market where the price is higher Arbitrage is conducted especially in foreign exchange markets, and in Stock Exchange securities It is also applied to commodities such as wheat and coffee, dealt in by exchanges in several centres By telegraphic communications the arbitrageur can know the exact price of a share, for example, in Paris, New York, and London, and can buy and sell by telegraph or by telephone at once

**Arbitration**, adjudication of matters in dispute by one or more private persons, whose decision the disputants have agreed, or been compelled, to accept Almost any dispute may be submitted to arbitration, but its chief importance lies in its application to international and industrial disputes

**International** One of the means employed for the peaceful settlement of international disputes, differing from negotiation, mediation and good offices, in that it involves the appointment by the parties of umpires who sit as a tribunal and make an award Their proceedings are only semi-judicial, and not to be confused with the proceedings of a Court of Justice, such as the Permanent Court of International Justice Since there is no central political authority above the sovereign States, and no such international Court as can exercise jurisdiction over them without their consent, arbitration, like any other means of pacific settlement, can only be resorted to by agreement among the parties This agreement may be made either in respect of a particular dispute that has arisen, or a State may sign an Arbitration Treaty with another, by

which the parties bind themselves to submit all or certain disputes that may arise between them to arbitral settlement

Arbitration is as old as international relationship. It existed in Ancient Greece and Rome. In the Middle Ages it was frequently employed and a favourite umpire or arbitrator was the Pope. From the 14th cent. on, however, the practice began to decay and by the 18th cent. had become rare, though many jurists and philosophers were occupied with the question. The Jay Treaty of 1794 between England and the U.S.A. whereby several questions were to be settled by arbitration gave the movement a noteworthy impetus. From then on arbitration began to grow more and more frequent and numerous arbitration treaties were concluded, the most important being The Hague Conventions and the Bryan Peace Treaties 1914 made between the U.S.A. and no less than 30 other States. The Hague Conventions 1899 and 1907 dealt thoroughly with the matter of arbitration procedure, the kind of disputes that ought to be submitted to it, etc. and in addition established in 1900 the Permanent Court of Arbitration at The Hague as a result of a conference called by the Tsar of Russia. This has made many important awards, e.g. *France v. Great Britain* (1905) concerning the Muscat Dhows, *Germany v. France* (1909) concerning the Casablanca incident, *U.S.A. v. Great Britain* (1910) concerning the Atlantic Fisheries. It works side by side with the Permanent Court of International Justice (q.v.) established in 1919.

Arbitration, Industrial, see WAGE BOARDS

Arboretum, a tree garden or enclosure devoted to the culture of trees and shrubs for scientific observation and the preservation of choice species.

Arboreculture, see FORESTRY

Arboreus [ARBORVITÆ] a small tree with drooping branches is mentioned in Gerard's *Herbal* in 1597.

It is often grown as an ornamental tree or shrub. See also CONIFERS.

Arbroath (Aberbrothok) port and royal burgh. County of Angus, Scotland, c. 1 m. N.E. of Dundee. There is a good harbour dating from the 14th cent. The chief local industries are the manufacture of canvas, linens, sailcloth, boots and shoes. Arbroath has a long history, having been created a royal burgh in 1186; there is a parish church begun in the 16th cent. and the ruins of a fine abbey founded by William the Lion, who was buried there. Arbroath (Fairport) is the scene of the action of Scott's novel *The Fortunate Pilgrims*. Pop. c. 19,000.

Arbutus, John (1687-1735) British physician and scholar, taught mathematics in London, graduated at St. Andrews and was elected F.R.S. in 1704 for his mathematical work. He was physician to Queen Anne. As a friend of Pope and Swift, he was famed for his wit and writings and was the author of *Miscellaneous Prose and Verse* and *Memoirs of Martinus Scriblerus*.

Arbutus, a genus of the dicotyledonous family Ericaceae (the Heaths). *Arbutus unedo* an evergreen shrub with white bell-shaped flowers and scarlet fruits is called *Strawberry tree* from the resemblance of its fruit to a strawberry. It is however by no means pleasant to the taste. The species are mainly hardy evergreens growing best in sandy loam or peat. A few require greenhouse protection in winter. Propagation by seeds, budding and inarching.

Arc (Electric). If two electric conductors are connected to a supply at a potential of several thousands of volts, the discharge will pass and continue over a space of an appreciable fraction of an inch. This does not happen with ordinary supply voltages of one to two hundred. But with these voltages, if the two conductors are first made to touch and then separated, a flame discharge is maintained between them which is fairly steady, especially if sufficient wire resistance is included in



the circuit. This phenomenon is known as the electric arc, and was discovered by Sir Humphrey Davy in 1801. He found in particular that if carbon in the form of rods was used as the conductor, a very steady and brilliant light was emitted by the positive pole, the carbon there being heated over a considerable area called the "crater" to a temperature of over  $3000^{\circ}\text{C}$ , in fact, to the temperature at which carbon vaporises freely into the atmosphere. The phenomena taking place in this discharge are very complicated, and have not much bearing upon the practical use of the arc. Many years after the development of electric lighting in the 'eighties of last century, arc lighting by means of pure carbon rods working either in open air or in a closed space to reduce oxidation was almost universal where high-power lighting was needed. Just before the World War these arcs were being superseded by "flame arcs," in which electrodes, consisting of carbon heavily charged with the fluorides of calcium and magnesium, were used. In these the light was emitted, not from the electrode, but from the flame, which is nearly colourless in the case of the pure carbon arc, but emits a powerful radiation composed of the spectra of the metals employed when the carbon is fed with metallic salts.

The advent of the gas-filled incandescent lamp (see ELECTRIC LIGHTING) has killed the use of the arc lamp for street lighting and similar purposes, on account of the high cost of labour in trimming the lamps. The arc is now used only where it is required to obtain efficiently a powerful concentrated light source, the most important case is that of the projection of cinematograph films and of the searchlight in which instances the incandescent lamp though now closely approaching the arc in efficiency and much excelling it in convenience, has not been able to oust it.

A most important recent development is the use of the electric arc in various forms for welding metals (see

WELDING). See also CONDUCTION OF ELECTRICITY THROUGH GASES.

**Arcade** (ΑΡΧΑΔΕ΄), in architecture, a series of arches carried on columns or piers, separating the nave of a church from the aisles, forming part of a cloister or covered walk, or decorating a blank wall (in which case they are called blind arcades). See also TRI-ORIUM. Sometimes the arches interlace, a common feature of Hispano-Moresque architecture.

**Arcadia**, district of the Peloponnesus in Greece, occupying the centre of the peninsula, isolated by mountain barriers and sparsely inhabited by shepherds. Arcadia occupied a strategic position between Sparta and the N. Greek States, but contributed little to Greek institutional life, hence the legend perpetuated in modern times of the innocence and simplicity of the Arcadians. Arcadian cities included Mantinea, Tegea, and (after 371 B.C.) the federal capital Megalopolis. The modern province has an area of 1125 sq. m., pop., c. 155,000.

**Arch** (archi), curved structure of masonry blocks so arranged that the blocks mutually support each other. Except in the case of a blind arch, used decoratively (see ARCADE), its purpose is to carry a superstructure over an opening, such as a passage-way, window, or door, or to bridge a river or other obstacle. A series of arches in depth forms a barrel vault (see VAULT), a series in line forms an arcade.

The arch rests on two imposts (piers or columns), usually of equal height; where they are unequal, we have a rampant arch. Where the imposts are set obliquely instead of at right angles to the opening, the arch becomes a skew arch. A reversed arch is used for the lower half of a circular window, for the bottom section of a conduit, etc. In the case of an arcade, adjoining arches share imposts.

The wedge-shaped blocks composing the arch are called voussoirs; the top (central) block is the keystone, the lowest blocks (resting on the piers) the

springers and the intermediate blocks the haunches

The inner or lower surface of the arch is called the soffit or intrados the upper or outer surface the extrados The width between the springers is the span the distance from the lower line of the springers to the top of the soffit the rise The triangular spaces between the arches are called spandrels



The many varieties of arches include the round or semicircular arch used in Romanesque architecture and the pointed arch the simplest form of which is the equilateral pointed arch, which may be regarded as the inter section of two semicircular arches The pointed arch, though not unknown in Romanesque is characteristic of Gothic architecture

The arch is of great importance to connect on with vault construction Common variants of the round arch are the stilted arch where the sides are continued down vertically and the horseshoe arch used in Moorish architecture Common variants of pointed arches due to modification and multiplication of centering are the lancet arch (characteristic of Early English) the ogive arch (introducing reversed curves) Decorated and Flamboyant styles and the Tudor arch (four-centred)

The arch was known in Mesopotamia and Egypt from the 4th millennium B.C. but does not appear to have been used in ancient Greece The Mycenaean beehive tombs were not arched vaults being formed of stepped flat courses of masonry The Etruscan introduced the arch into Europe and the Romans popularized it

A feature of Roman architecture is the ornamental triumphal arch, and still more so, having an elaborate superstructure which has been one of

in modern times as in the case of the Marble Arch (London) and the Arc de Triomphe (Paris)

**Arch, Joseph** (1866-1919) English Labour leader founder of the National Agricultural Labourers Union worked for improvement in the wages and conditions of agricultural labourers and was M.P. on two occasions before 1900

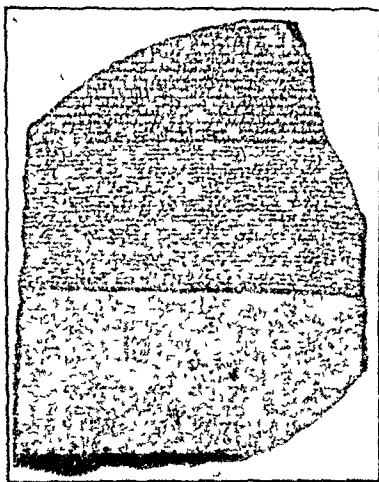
**Archæan** (AR KE AN) System (geol.) also called Pre-Cambrian (q.v.) Azoic or Eozoic the earliest system of rocks It includes igneous stratified and metamorphic rocks and frequently includes aluable mineral The occurrence of fossils has been alleged but is not proved The term Pre-Cambrian is to be preferred for designating the system because in America the Archæan is taken as including only the older Pre-Cambrian rocks the name Algonkian being given to a newer series of Pre-Cambrian beds

**Archæology** the science which investigates the culture of the past and sets forth in an ordered manner those discovered artifacts that tell of the doings of man in distant ages The archæologist must possess skill and delicacy of touch for one blow of a pick may smash the treasured relic and one puff of earth may carry away priceless treasures hence sites where remains are known or expected are carefully guarded against the delving activities of amateurs no matter how enthusiastic they may be It is the business of the professional archæologist to unearth the "graved store" of the scholar to read the inscription of the historian to piece it in its chronological setting and in the event of skeletal remains coming to light of the anthropologist to pronounce upon them but every archæologist should have a working knowledge of the sister sciences

One of the greatest archæological triumphs was that of Sir Arthur Evans at Knossos where he discovered and entirely reconstructed the Palace a three-storied building that had been burned and collapsed The Court of



wooden beams were replaced by steel girders, and it is now possible to mount the ancient stairs treading the very stones that were trodden in those far-off days. It is seldom that funds permit of things being done on so grand a scale, and indeed the Knossian Palace might still be a heap of rubbish had not Sir Arthur Evans found the requisite sum of money himself, but it is usual to preserve artifacts when they arrive at the museums, and examples may be seen in the remains brought from Ur by Mr Woolley and treated



The Rosetta Stone  
(3 ft 9 in high, 2 ft 4 in wide, 11 in thick)

in the British Museum laboratory by Drs Alexander Scott and Plenderleith.

The early archæologists pounced delightedly upon obvious treasures, and simply ignored the "rubbish." They were amused when Sir James Flinders Petrie insisted upon recording everything turned up, but as knowledge has developed Sir James has been proved right, for bits and pieces that 50 years ago might have been passed over as rubbish mean a great deal to-day.

The nature of the soil naturally

enough affects the state of preservation in which artifacts are found. The hot, dry sand of Egypt preserves all kinds of material—linen, leather, food, and flesh, bread has been found dating from 2000 B.C., and the bodies of men from a much earlier period. Peat is a good preserver, and articles of food have been found in Swiss lakes. Pottery is considered indestructible, because though it is easily broken the pieces remain, while objects of metal either oxidise or corrode through some other chemical change, gold being the exception.

In the event of a people possessing a script that we can not only read but understand, the work of archæology is rendered richer, fuller, and brighter by the knowledge of the men of old. An example of a script that we can read but not understand is the Etruscan. The characters are Greek, but the words are not. The famous Rosetta stone provided the key to the Egyptian hieroglyphics. On this block of granite a public notice had been engraved in three languages, just as in the E. End of London "Break glass and pull" is inscribed in English and Yiddish on the fire alarms. One of the languages on the Rosetta stone was Greek, and Dr Thomas Young, an English Quaker, discovered the "phonetic method" of reading the hieroglyphics, using the words Berenice and Ptolemy as his cue.

Greece and Italy, Palestine and Syria were open books, and the cuneiform inscriptions of Assyria, Elam, Babylon, and Persia have been available to us for some 80 years past. Minoan Cretan script and the hieroglyphics of the Hittites of Anatolia still await deciphering, whilst the Maya of Yucatán (Central America) has at last yielded a few words. We know more of the ancient Sumerian kings than we do of our own legendary King Arthur.

The first archæologists were the Italian of the 15th cent., who began to take an interest in the ruins in their land. In the 16th cent the artists

began to study the antique as a sound basis for their work. Popes and princes of the period making collections of ancient sculptures. In the 17th cent. Tradescant an English merchant made a collection that ultimately formed the nucleus of the Ashmolean Museum at Oxford. In the 18th cent. such acquisition became a fashion and English nobles spent much time and money excavating, however in expertly in Italy to turn up the carved stones of the past and so uncovered Pompeii and Herculaneum. Napoleon Bonaparte also took savants into Egypt.

Winckelmann opened up the Greek field and Lord Elgin brought back to England the marbles of the Parthenon. Botta and Layard worked in Assyria and the Bulls of Nineveh were brought to the British Museum. Schliemann a merchant made startling discoveries at Troy and Mycenae (see *AEGEAN CIVILIZATION*).

In 1883 the modern epoch of archaeology opened with the founding of the Egyptian Exploration Fund and Sir James Henderson Petrie's methods of working have become the standard of archaeological practice. Many brilliant names appear and much momentous work has been done in revealing the ways of life of the men of old. Archaeology has put the breath of life into the bare narrative portions of the Bible, the Babylonian clay tablets have revealed the source of Moses' inspiration and Petrie and Neville considered they had settled the Israelites' route out of Egypt although this is by no means certain (see *STONE AGE*, *Bronze Age*, *ANTHROPOLOGY*, *EGYPTIAN HISTORY*, *MAN*, *DIFFUSIONISM* etc.).

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**Archaeopteryx**, a fossil bird of the Jurassic period. Interesting as connecting modern birds with reptiles. It had teeth and a long bony tail but was a bird by reason of its wings and feathers.

**Archaism** an *αρχαϊσμός*, the employment in speech or writing of antiquated or obsolete words and phrases. Also such a word or phrase itself. The use for example in modern speech of the pronoun *thou* is an archaism.

**Archangel** (*Архангелск*) (1) N. Province of U.S.S.R. situated between the White Sea and the R. N. Dvina and Vologda. The N. of the province is within the Arctic circle, the middle in the tundra belt and the S. reaches the coniferous forest area. It is drained by the Dvina, Onega, Pechora and Mezen. Fishing and the fur trade are the most important occupations. Some cereals (rye, oats and flax) are cultivated in the S. The chief minerals are lignite, naphtha and salt. Archangel is a non autonomous province and is a somewhat reduced edition of its Tsarist prototype. Most of the coast is icebound for long periods but Khatyrina Harbour is ice-free. Pop. c. 420,000. (2) White Sea port on the delta of the Dvina and the chief town and administrative centre of (1). There is a large harbour and most of the trade of the White Sea passes through the port. Trade is mainly in timber, hides, flax and linseed are important items. There is rail and canal connection with the S. The port is icebound from Nov. to May. Before the building of St. Petersburg (Leningrad) Archangel was the only Muscovite port. In 1918 it was the base of an Allied counter-revolutionary attack on the Bolsheviks but the expeditionary force had to be evacuated in 1919. Pop. 128,800.

**Archbishop**, an ecclesiastical dignitary in charge of a province which includes several episcopal sees. In

England and Wales there are three of the English Church—Canterbury, York, and Wales, four of the Roman Church—Westminster, Birmingham, Cardiff, and Liverpool

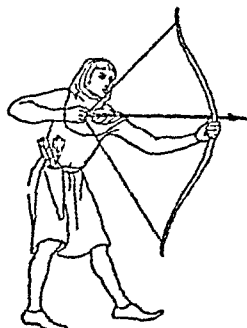
**Archdeacon**, an officer of the Church of England, whose duties are to act for the bishop in administrative matters. Originally an ordinary deacon chosen to assist the bishop, he is now a priest, and ranks after a dean. In the Roman Catholic Church the office has fallen into disuse.

**Archduke**, the title taken by all members of the Austrian and Russian Royal families, denoting a pre-eminence above other dukes. It is first heard of c. the year A.D. 960, but was borne continuously only from the 15th cent.

**Archer, Frederick** (1857–1886), English jockey. His first victory was in 1870, he first won the Derby and the St Leger in 1877 on Lord Falmouth's *Silvio*. Archer rode 241 winners in 1884, and had 2748 victories during his turf career.

**Archer, William** (1856–1924), British dramatic critic and translator of Ibsen, whose works he brought to the notice of the British public. He wrote the popular play, *The Green Goddess* (1921).

**Archer-fish**, a small Indian freshwater fish which can capture small insects by squirting drops of water at them.



Archer

**Archery**, the practice or sport of shooting with bow and arrow. The use of archery in war and the chase is of immense antiquity. The ancient Egyptians and many Asiatic peoples made

great use of the bow in warfare, and archers formed an important part in the Japanese armies until well into the 19th cent. Neither Greeks nor Romans, on the other hand, were notable archers, but relied for their supply of bowmen on Cretan and Asiatic mercenaries. The mounted bowmen of Parthia proved formidable opponents to the Roman legions, and horse-archers formed the main strength of the armies of the E. Roman Empire from the 4th cent. A.D. Among Celtic and Teutonic peoples only the Welsh and Scandinavians paid much attention to archery. The Normans made effective use of archers in conjunction with heavy cavalry, but it was not till the 13th cent., when Edward I introduced the long-bow from Wales, that English bowmen gained the great reputation which remained unchallenged till the end of the 16th cent. The introduction of fire-arms led to the rapid decline of archery, owing mainly to the fact that the use of the primitive hand-guns was more easily learnt. A skilful archer had to be trained to his weapon from childhood.

The practice of shooting with bow and arrow for amusement, which fell into disuse with the decline of the long-bow as a weapon, was revived in the 18th cent. The *Royal Toxophilite Society*, founded in 1781, till 1922 had its ground in Regent's Park, London, the *Woodmen of Arden*, founded in 1785, have their headquarters at Meriden, in Warwickshire. The chief Scottish society, the *Royal Company of Archers* (the King's Bodyguard for Scotland), was founded in 1676, as a semi-military body. Archery meetings are now controlled by the *Grand National Archery Association*, founded in 1801.

The average length of the bow is 6 ft., with a drawing power of from 40 to 60 lb. for men, 5½ ft., and 24 to 32 lb. for women. Bows are either made wholly of yew ("self" bows), or of yew combined with hickory and other woods glued in strips ("backed" bows). The string consists of 3 strands of hemp dressed with glue. The

# Archery

971

# Archery

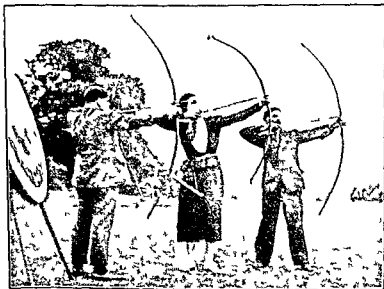
arrows are from 27 to 30 in long and made of red deal with 3 turkey or peacock feathers  $1\frac{1}{2}$  in long by  $\frac{1}{4}$  in deep. The weight of an arrow is reckoned in English silver the average weight being from 4 to 5 shillings. *Targets* are 4 ft in diameter sloping slightly backwards and marked with concentric rings  $4\frac{1}{2}$  in wide the outer ring (white) counts 1 point the next (black) 3 points the third (blue) 5 the fourth (red) 7 and the centre (gold) 9 points. Usual ranges are 100 80 and 60 yd for men 60 and 50 yd for women. A *York Round* consists of 144 arrows 9 at 100 yd 48 at 80 yd and 94 at 60 yd. A *St George's Round* consists of 36 arrows at each range and a *National Round* (for women) of 48 arrows at 60 yd and 4 at 50 yds.

Winners are usually decided by the gross score but at championship meetings by points 2 points for highest score of round 2 for most hits on

round and 1 each for highest score and most hit at each range.

*Clout* or long distance shooting is practised mainly by the Woodmen of Arden and by the Royal Company of Archers. A white target with a black centre is used and both target and centre are known as the Clout.

This is surrounded by rings on the ground at  $1\frac{1}{2}$  3 6 and 9 ft a hit in the outer ring counts 1 in the next and so on. The ranges are 180 200 and 240 yd known as 9 10 and 12 score. A would have clapped 1 the clout at twelve score. Shakespeare *Henry IV* Act III. In Scotland any arrow within 4 ft of the clout counts 1 a hit in the clout 2. The first archery championship was held in 1864 and the most notable champion was H A Ford (1880) who was 10 times champion 11 times in succession (from 1849 to 1859) and again in 1867.



Archery Practice at Royal Arch Club London.

**Arches, Court of**, ecclesiastical court of appeal of the Archbishop of Canterbury, so called because it was formerly held at the Church of St Mary of the Arches, now called St Mary-le-Bow, Cheapside, London. The presiding judge of this Court is called the Dean of the Arches

**Archidamus**, name of 5 Spartan kings from the 5th to the 3rd cents B.C. They were capable rulers, who were successful in wars, Archidamus III, for instance, winning a battle against the Arcadians without the loss of a Spartan soldier

**Archimandrite**, the equivalent of an abbot in the Orthodox Greek and Russian Churches

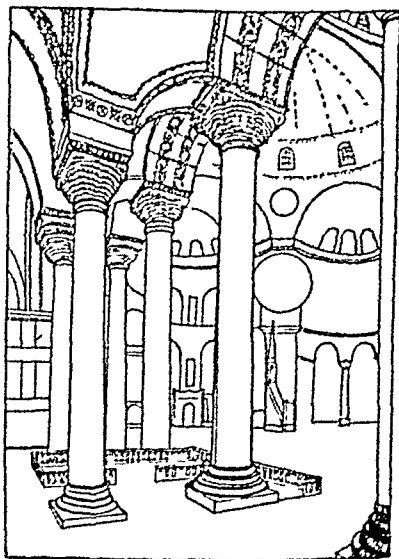
**Archimedeian Screw**, apparatus for raising water, consisting of a tube or channel in the shape of a corkscrew, set at an inclination of  $c 45^\circ$  with the lower end in the water, when the apparatus is rotated the water flows upwards and out of the tube at the upper end. Used in irrigation (q.v.)

**Archimedes** (c. 287–212 B.C.), Greek mathematician, popularly known as the originator of *Archimedes' Principle* in physics. Born in Sicily, Archimedes studied in Alexandria, and returned later to devote his life to mathematical investigation. He discovered the use of levers in weight lifting, constructed a defensive machine for war use, and in mechanics and mathematics propounded principles, particularly in geometry, of lasting importance. Archimedes was killed when the Romans captured Syracuse by a soldier who did not know the inventor's identity.

**Architecture**, the art of applying beauty, utility, and emotional expression to building. It originated in man's attempt to supply one of his most pressing physical needs, that of shelter from inclement weather. The cave and the tent were used by primitive nomadic peoples for this purpose. Later, owing to the scarcity of wood in Egypt, the value of clay was discovered, and the art of brickmaking began. The earliest examples of archi-

tectural skill are found in Chaldea and Egypt, the Egyptians making use of brick vaults as early as 1540 B.C., though the post-and-lintel form was general until the time of the Romans.

Next in point of antiquity probably ranks the architecture of the *Ægean* civilisation (q.v.). The art was also cultivated at a very early period in China and India, where it appears to have remained stationary in



Architecture (Santa Sophia, Interior)

style and perfection to the present day, and it attained characteristic excellence in the chief kingdoms of W. Asia, Assyria, Babylon, and Persia (q.v.).

In Greece the art reached its almost perfect development, the buildings having symmetry of form, unity of design, and correctness of outline, which have never been surpassed. Greek architecture is characterised by the three great orders, Doric, Ionic, and Corinthian. The Romans copied Greece and modified without improving Greek models. A great structural advance was, however, made by their

development of the arch which they copied from the Etruscans

The spread of Christianity led to further departures from the classic examples and the removal of the imperial capital to Constantinople gave rise to the Byzantine school. The development of Christian architecture from the Byzantine and Romanesque to the Gothic and Renaissance styles is an index of the changing ideal and artistic conceptions in Europe.

All architecture should respond to the three essentials laid down by Vitruvius the father of architectural literature—stability, utility, and beauty. In every great period and style these essentials are found, however the conception of beauty may differ. The mere construction of a wall is building—a trade—but a city wall with its ramparts, its decorative arches, its carved doorways, all blending in beauty, design, and purpose is architecture. See also ASSYRIAN, BYZANTINE, EGYPTIAN, ETRUSCAN, EARLY CHRISTIAN, GOTHIC, GREEK, INDIAN, MODERN, PERSIAN, ROMAN, ROMANESQUE, AND RENAISSANCE.

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**Architecture.** **Conspectus of History.** **EGYPT.** *Archæic Period* (before 3000 B.C.) Pre-dynastic and dynastic mastaba tombs, fluted columns of 3rd Dynasty anticipating Greek Doric. Stepped pyramid of Sakkara—Old Kingdom (3000-2600 B.C.) 4th Dynasty pyramid—Middle Kingdom (2600-1600 B.C.) rock-cut tombs and temples. 19th Dynasty temples at Abu-Simbel (c. 1500 B.C.) pyramids of Fayyum, obelisks—New Kingdom

(1800-1000 B.C.) great temples at Karnak, Thebes, Abydos etc.—after 1000 B.C. temples at Edfu, Philæ, Dendera.

**BABYLONIA, ASSYRIA, MESOPOTAMIA.** *Early Sumerian Period* (before 3000-2500 B.C.) cemeteries at Ur (c. 3500 B.C.) small buildings of burnt and sun-dried brick—2500-2250 B.C. cities with temple precincts each having a temple tower or Ziggurat (e.g. Tower of Babel), brick columns—Assyria Persepolis (1300-600 B.C.) cities of Assur, Nineveh, Nimrud, Khorsabad etc. strongly fortified, city walls with battlements, towers and gates ornamented with colossal lions, monsters etc.—New Babylonian Empire (600-539 B.C.) Babylon—still stronger fortifications, glazed



Philæ Temple of Egypt.

bricks, sacred processional way to Ishtar gate, hanging gardens. Ur—Temples, great Ziggurat.

**GREEK CIVILISATION.** Crete, Cyclades, Mycenæ, Greek Mainland. *Early Minoan* (3400-2100 B.C.) round buildings of sun-dried brick in Crete and at Orchomenos—*Middle Minoan* (2100-1550 B.C.) Troy (6th city), cities in Crete (Knossos, Phaistos, Hagia Triada etc.) palaces built round central courts, colonnaded porticoes, tapering columns—*Late Minoan* (1550-1100 B.C.) cities of Mycenæ, Tiryns, Thebes etc., massive fortifications of cyclopean masonry (e.g. Tiryns), shaft-graves at Mycenæ, beehive tombs at Mycenæ, Orchomenos, Vaphio, Menidi etc., palaces of the Megaron type with hall approached by pillared ante-room and

no central court, doorways narrowing upwards with huge stone lintels, sometimes flanked by columns tapering

downwards as at the "Treasury of Atreus" at Mycenæ, or in the case of the Lion Gate at Mycenæ, with carved animal figures

supporting an emblematic pillar

**GREEK ARCHITECTURE**  
*Primitive Period* (1100-600 B.C.) Greek architecture begins again with the Dorian invasion (c. 1100 B.C.) Primitive temples were apsidal oblong with curved walls, or oblong with straight sides walls were of sun-dried brick on stone socles. As the temples became wider their roofs had to be additionally supported by a central row (later two rows) of wooden columns, which were continued into a portico (*Pronaos*). Two styles of column decoration, *Proto-Doric* and *Proto-Ionic*, were evolved. The wooden columns were gradually

replaced by stone columns, as at the Temple of Hera (c. 7th cent. B.C.) at

Olympia, where the replacement took 8 centuries

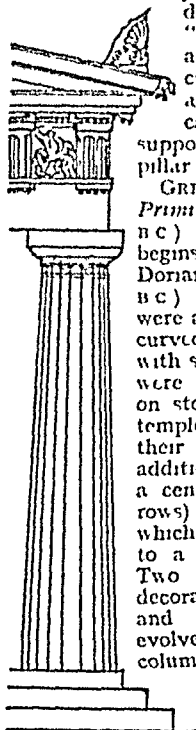
*Archaic Period* (600-480 B.C.) The Doric and Ionic styles now develop together, the columns are fluted (number of flutes varies), and are often made up of sections. *Doric Style* Greece Temples of Apollo at Corinth (c. 540 B.C.), of Zeus at Athens, and of Apollo at Delphi, temple of Ægina, treasuries at Delphi, Delos, and Olympia—Italy and Sicily Temples at Paestum ("Basilica"), Selinus, Agrigento, Syracuse, Ortygia. *Ionic Style* Temples of Artemis at

Ephesus, of Hera at Samos, treasuries of the Cnadians and Siphnians at Delphi

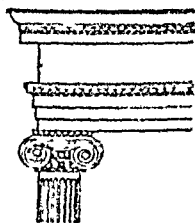
*Classical Period* (480-400 B.C.). Some buildings are of limestone (*Poros*) coated with marble stucco, others of marble. Much of the decoration is coloured red, blue, etc. Great activity under Pericles (d. 429 B.C.) at Athens. *Doric Style* Greece Athens (Acropolis, etc.), Parthenon (447-32); Ictinus and Callicrates, architects), Propylæa (437-32, Mnesicles), Theatre of Dionysus, "Theatron"; temples of Zeus at Olympia, of Poseidon at Sunium, of Apollo at Bassæ; Argive Heraeum—Italy and Sicily. Temple of Poseidon at Paestum (c. 460 B.C.), Olympieum at Agrigento. *Ionic Style* Erechtheum and Temple of Nike on Acropolis, Athens. The *Corinthian Style* makes its first appearance (column inside temple at Bassæ).

*Fourth Century and Hellenistic* (400-146 B.C.) *Doric Style* Temple of Athena Alea at Tegea, Metroum and Leonideum at Olympia, Temple of Æsculapius at Epidaurus. *Ionic Style* Philippeum at Olympia, Mausoleum at Halicarnassus, Temple of Athena at Priene, Altar of Zeus at Pergamum (2nd cent. B.C.). *Corinthian Style* Athens.

Monument of Lysicrates (334 B.C.), Olympieum (174 B.C., Cassutius, architect). Tower of the Winds (1st cent.). Other buildings included theatres (*passim*), monumental altars (Syracuse, Pergamum, etc.), colonnades or Stoa (Athens, Olympia, Megalopolis, etc.), propylæa (Epidaurus, Olympia, Samothrace,



Doric Column



Ionic Column

etc.) The figured capital much used by the Romans appears in the later Hellenistic period

**ETRUSCAN ARCHITECTURE** The form of the Greek temple is modified to an almost square shape. The extensive use of wood permitted wider intercolumniations. terra-cotta much used in decoration. The arch is introduced. Cemeteries dating from 8th to 3rd cent at Vetulonia, Caere (Regolini Galassi Tomb), Corneto (tombs covered with frescoes), Vulci, Chiusi (Clusium), Populonia and Volterra (Volaterræ).

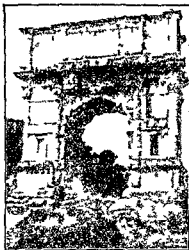
**ROMAN ARCHITECTURE** The Romans added two new orders—*Tuscan* based on Doric and *Composite* a blend of Corinthian and Ionic. The introduction of the arch (from Etruscan) vault and dome



Corinthian Column

permitted great architectural innovations. Column and arch were combined e.g. in the triumphal arch. Materials used were tufa travertine and concrete and for private houses unburnt bricks. Burnt bricks, tiles and marble were used mainly for facings. Stucco inherited from the Greeks was much used for interior facing. Circular temples became common. The authority on Roman architecture was Vitruvius.

*R. public* (before 27 B.C.) Pons Æmilius, Aquæ Marcæ, Milvian Bridge, Cloaca Maxima, Temples of Vesta at Tivoli, of Fortuna at Præneste, of Fortuna Virilis at Rome.



Rom. Arch. Tit. L.

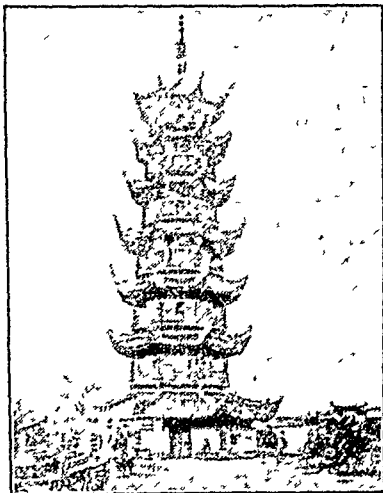
House of Livia, Basilica Julia, Tabularium, Temples of Apollo and Jupiter at Pompeii.

*Empire to A.D. 488* Rome: Temples of Castor and Pollux (fine example of Corinthian order), of Vesta, of Mars Ultor, of Concord, of Saturn, of Vespasian and Titus, Colosseum with successive tiers of Doric, Ionic and Corinthian columns. Theatre of Marcellus, Temple of Rome and Augustus at Athens, Maison Carrée at Nîmes (the best preserved Roman temple), Triumphal arches of Titus at Rome, of Augustus at Susa, of Tiberius at Orange. Theatres at Orange (the best preserved), Taormina, amphitheatres at Nîmes, Arles, Bridge at Rimini.

*Trajan to Constantine the Great (98-337)* Rome: Temple of Venus and Rome, Forum of Trajan with Basilica Ulpia, Basilicas of Maxentius and Constantine. Under Hadrian (A.D. 138) great building activity in Rome and Greece: Pantheon, Castel Sant'Angelo etc. in Rome; Olympieum in Athens. In C. Atticus (c. 101-77) built



built for the Shoguns, much lacquer and carving, development of the dwelling-house and garden.

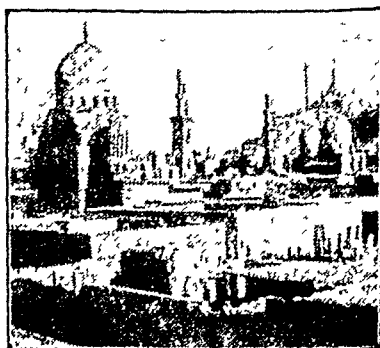


Chinese Pagoda

**MOHAMMEDAN ARCHITECTURE** Chief feature the Mosque *Omayyad Style*, Palestine and Egypt Dome of the Rock and Aqsa Mosque at Jerusalem, palace at Mshatta (E of Dead Sea), mosques at Damascus and in Egypt — *Moorish Style* (from 7th cent) mosques with colonnaded courts, horse-shoe arches on slender columns, tiling, arabesques, and mosaic decoration, domes and minarets Mosques at Cordoba (8th–10th cents), Saragossa, Alhambra, Granada, Alcazar, Seville — *Abbasid Style* (8th–9th cents) mosques at Samarra, Cairo, etc — *Perso-Turkish Style* Blue Mosque at Tabriz (15th cent), mosques at Samarkand, Ispahan, etc, mausoleums at Merv, Samarkand, etc — *Mameluke Style* (13th–16th cents) Tombs of the Mamelukes at Cairo, mosques at Cairo, Damascus, Aleppo, etc — *Ottoman Style*, characterised by immense domes Sulaimanya (1550–56) at Constantinople, Salimya at

Adrianople — *Indian Mohammedan Style* Great Mosque and Kutb Minar minaret at Delhi, mausoleums at Agra (Taj Mahal), Delhi (Tomb of Humayun), Ajmere, etc

**EARLY CHRISTIAN ARCHITECTURE** Basilicas *Rome* St John Lateran, Old St Peter's (A.D. 324), St Paul's (San Paolo fuori le Mura), Santa Maria Maggiore, San Lorenzo fuori le Mura (432), San Clemente *Ravenna* Sant' Apollinare Nuovo (493), Sant' Apollinare in Classe (538) *Istria* Cathedral of Parenzo *Athens* St Philip. *Salonica* St. Demetrius *France* St Martin, Tours *Syria and Palestine* Church of Paulinus at Tyre (313), Church of Constantine at Jerusalem (333), Church of the Nativity at Bethlehem (440) — Other buildings *Rome* Circular baptistery of St John Lateran, San Stefano Rotondo (468) *Ravenna* Mausoleum of Galla Placidia (450), baptisteries, Tomb of Theodoric *Milan* Sant' Ambrogio (original church, 386), San Lorenzo (6th cent) *Syria* Church of Kalat-Seman, Church of Kalb-Lauzeh *Egypt* Coptic churches Red and White Monasteries at Suhag *N Africa* Basilica of Itebessa



Mameluke Tombs, Cairo

**ENGLAND** *Pre-Conquest* Early Christian and Saxon basilicas at Silchester (4th cent), Canterbury (597), Rochester (604), Lyminge (633), Re-

culver (670) Brixworth (680) churches at Hexham and Monkwearmouth crypt at Ripon (all c. 675) Saxon cathedrals at Canterbury Winchester York Saxon churches at Larks Barton Barton-on-Humber Ramsey Deerhurst Stow (Lincs)



Byzantine Capital

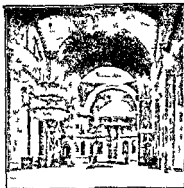
Norton (Durham) Wing (Bucks) Sompting (Sussex) Barnack (Northants) etc. Edward the Confessor's church at Westminster anticipates Norman Saxon crosses with interlaced

cable pattern are characteristic

**BYZANTINE ARCHITECTURE** Byzantine architects solved the problem of placing a dome over a square room by means of the pendentive. Domed brick buildings of basilica plan later modified into that of a Greek cross interior richly decorated with marble and mosaics—Constantinople. Hagia Sophia (Great Church) of Constantinople with columns having a projecting block or *dosseret*. Church of SS Sergius and Bacchus (527). St. Sophia (53-7) architects Isidorus of Miletus and Anthemius of Tralles. Church of Holy Apostles (536). St. Irene Churches of the Virgin Mother of God and of Chora (Mosaic Mosque 11th cent.) both with wide narthexes. Hebdomon Palace—Italy. Ravenna. San Vitale (539). Venice. St. Mark's (from 4th cent. first basilican church 99). Byzantine rebuilding 1063). Byzantine palaces—Greece. Salonika. St. Sophia Church of the Apostles. Athens. small Metropolis (cathedral) and many other churches. Daphne (near Athens) monastery church. Phocis. St. Luke of Stiris (near Delphi). Mistra. Byzantine city 13th-cent church with tower

Mount Athos monastery church (10th-16th cents). Chios 11th cent. monastery church—Armenia. Cathedral at Echmiadzin church at Kutais cathedral at Ani—Russia. The characteristics include the bulbous Turkish cupola a multiplicity of bell-towers each surmounted by a cupola and the interior iconostasis (screen for icons). Cathedrals at Kiev (1010) and Novgorod (104). Moscow Church of the Assumption (1479). St. Basil (1531). 11th-cent cathedrals at Vladimir.

**ROMANESQUE ARCHITECTURE** Style develops from the basilica form features are massive proportions as apsidal E end with ambulatory and small (often apsidal) chapels development of Latin cross plan clustered piers as well as columns round arches introduction of triforium gallery between arcading and clerestory decorated doorways and experiments in stone vaulting in place of wooden

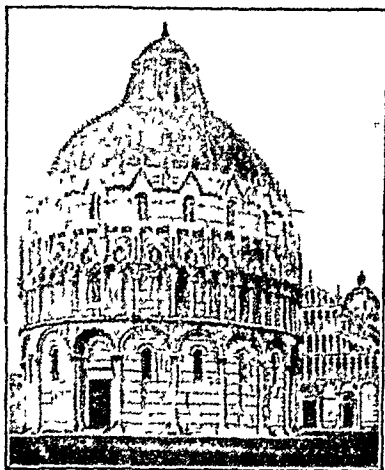


Byzantine Interior (Old St. Basil's Cathedral)

roofs. The pointed arch appears before the end of the period.

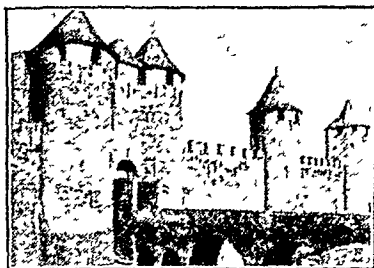
**EARLY ROMANESQUE** France. St. Jean Pottiers (11th cent). Germigny des Prés Orleans—Spain. Church at Baños de Cerrato near Palencia (68-711)—Italy. San Frediano Lucca (7th cent). Lombard churches choir (9th cent) of Sant Ambrogio

Milan San Michele, Pavia (burnt 1004, rebuilt 1155) — *Germany and Flanders* Charlemagne's churches at Aix-la-Chapelle (Aachen, 8th cent, domed



Circular Baptistery, Pisa

two-storied octagonal, externally 16-sided, building, with radiating aisles) and Nymwegen three churches on island of Reichenau, Lake Constance, church at Gernrode (960), St Michael, Hildesheim (1001), abbey church at Quedlinburg (936-1030)

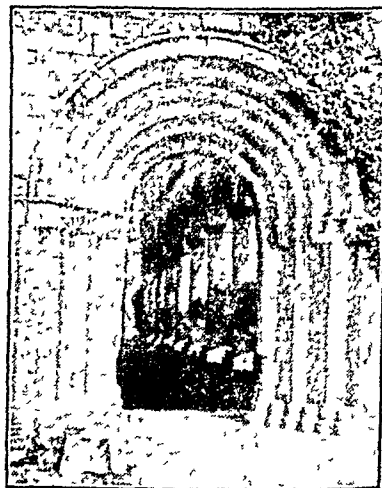


Carcassonne (Gate)

High Romanesque (1050-1150) and Transitional (1150-90) *Italy* Pisa cathedral (1063), baptistery (1153), and

campanile ("Leaning Tower,"; 1174-1350), Florence San Miniato (12th cent), baptistery, Verona San Zeno Maggiore (11th cent, rebuilt 1117-38), cathedrals at Parma (1058-74), Modena (1099-1184) and Lucca (12th cent), Milan nave (1128-86) of Sant'Ambrogio — *Sicily* Norman churches, Capella Palatino at Palermo, cathedrals at Monreale and Palermo

*France* East monastic church at Iournus (1019-66), cathedrals at Autun and Le Puy, abbey

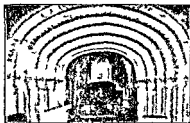


Fountains Abbey

church at Vézelay, church at Isoire, —West (Aquitaine, etc.) St Front, Périgueux (rebuilt 1120), cathedral at Angoulême (1105-28), church at Fontevrault, St Ours, Loches (rebuilt 1170) —South (Provence, etc.) Poitiers St Savin (oldest church in France, founded 4th cent) and Notre Dame (11th cent), St Trophime, Arles (founded 7th, rebuilt 12th cent.), St Gilles, near Nîmes, church at Moissac, Carcassonne nave (1096) of cathedral, fortifications and castle (12th cent, partly 6th cent) —North (Normandy) Caen St Etienne or

Abbaye aux Hommes and Abbaye aux Dames (both c 1070) abbey church Jumièges

*England* Norman and Transitional Cathedrals Winchester (tower and transepts 100-85) Canterbury (1070-1184) Rochester (107-1130) Gloucester (1070-1104) St Alban (from 10) Ely (from 1083) Worcester (from 1084) Durham (1003-1104) Norwich (1101) Chichester (1109) Peterborough (111) Exeter (towers) Ramsey church The church at Iffley Oxon exemplifies the late ornate period Abbeys Tewkesbury (117) Fountains Furness (1197) etc chapel Tower of



Lat Narva Cha 1 Ar b Tukeo 1 h tial L

founded 6th cent) minster church at Roermond (11th cent)

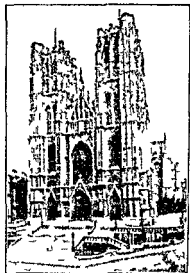
*Germany Switzerland Scandinavia*  
Cathedrals Maastricht (918-139)  
Speyer (1030-1169) Worms (1000-150) Brunswick (1173-94) abbey church Laach (mid 11th cent) Cologne St Mary in the-Capitol (1049) Apostles Church St Martin's (12th cent) Hildesheim St Godehard (11th cent) abbey church (basilica 1040) churches at Ratis



Norman Door and Porch Quening in Church Gloucester here.

London (12th cent) porch of Temple church (1185) castles of donjon (keep) type e.g. Rochester Tonbridge Hedingham Guildford Dover Richmond (Yorks) White Tower of London Walled cities e.g. York and Chester

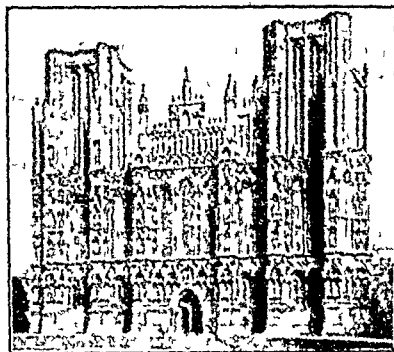
*Netherlands and Belgium* Cathedral at Tournai (1030) St Bartholomew's Liège (1015) St Servatius Maastricht (oldest church in Holland)



St. Gula Cathedral Brussels.

bon (Regensburg) and Erfurt Castles Wartburg (near Eisenach), Burg Dankwarderode, Brunswick, etc., Kaiserhaus, Goslar (11th-13th cent.) Transitional Cologne St Gereon (1200-27), St Kunibert (1205-48), cathedrals at Limburg-on-the-Lahn (1213-42), Bamberg (1192-1274), Naumburg sandstone cathedral at Basle (1010-1240), convent church Maulbronn (1178) Cathedrals at Lund (1145) and Roskilde (1215)

*Spain* Moorish influence in early churches San Maria de Naranco, near Oviedo (848-900), monastery of Valdedios (893), San Pablo del Campo, Barcelona (930) San Miguel



Wells Cathedral, West Front

de Escalada, near Leon (913) Later churches Cathedral of Santiago de Compostella (1032-1211), San Millan, Segovia, San Isidoro, Leon, San Vicente Avila (c 1100)

**GOthic ARCHITECTURE** The pointed arch, already introduced in Romanesque architecture, is now in general use. This form permits great development of window tracery, which reaches its highest elaboration in English Decorated and French Flamboyant. Ribbed stone vaults are universal. Structural features such as buttresses, flying buttresses, vault ribs, gables, etc., are treated decoratively. Improved knowledge of structural principles permitted greatly increased

height, combining with more slender proportions, resulting in gracefulness and strength, especially in the piers. In England the square end generally replaces the apse, almost universal on the Continent.

*France* **Early Gothic** Abbey Church, St Denis (1140-44), cathedrals Sens (1140), Noyon (1160; restored after World War), Senlis (1155), Laon (1163), and Notre Dame, Paris (1163) — **Rayonnant Gothic** Cathedrals Chartres (1194), Rheims (1210-50, restored after World War), Amiens (1220-70), Bourges (early 13th cent.), Beauvais (1247-1320), Sainte Chapelle, Paris (1241-50), Strasbourg Cathedral (1250-76), choir of Carcassonne Cathedral St Urban, Troyes (from 1202), Palace of Popes, and mausoleum of Pope John XXII, Avignon — **Flamboyant Gothic** (15th cent.) St Maclou, Rouen; W façade, Rouen Cathedral, Notre Dame, Alençon, W façade, St Vulfran, Abbeville, St Gervais, Paris, St Jacques, Dieppe, Church of Brou, Bourg-en-Bresse (1506-32, transitional to Renaissance)

*England* Many English churches and cathedrals present examples of all three periods of Gothic architecture, e.g. Ely Cathedral, some also include Norman or even Saxon elements, e.g. Winchester and Worcester Cathedrals.

**Early English** (1190-1245) lancet (narrow, pointed) windows, either single, or grouped in pairs, threes, etc. Anticipated in choir of Canterbury Cathedral (1175-78), Salisbury Cathedral (1220-66), Westminster Abbey (rebuilding of 1245), St Hugh's choir and nave, Lincoln, Cathedral (1190-1250), W front of Peterborough Cathedral (1200), Wells Cathedral (1170-90), choir of Worcester Cathedral (1222), Rievaulx Abbey Netley Abbey, Beverley Minster, "Five Sisters" (lancet windows) at York Minster.

**Decorated** Subdivided into *Geometric* (1245-1315) and *Curvilinear* (1315-60). Development of window tracery, large windows, subdivided



Magdalen Tower Oxford.

by mullions with interlacing bar tracery and at first strictly geometric later free flowing (reversed curves etc.) and producing an indefinite variety of design. Vaulting developed by introduction of tiercerons or additional ribs. Exeter Cathedral (1190-1307) Octagon of Ely Cathedral (1121-49) Window York Minster (1339) Angel Choir (1205-80) towers and S transept rose window Lincoln Cathedral St Mary's Beverley St Mary Redcliffe Bristol spire of Salisbury Cathedral Lady chapel Lichfield Cathedral towers and spires of parish churches Tintern Abbey (1291).

*Perpendicular* (1360-1500) or *Perkins* Style shows a reaction against the over-elaboration of window tracery in the Decorated period characterised by mullions running straight up (perpendicularly) to the top of the windows and by horizontal divisions. Windows become very large e.g. E windows of York Minster and Gloucester Cathedral. Vaulting however still further elaborated

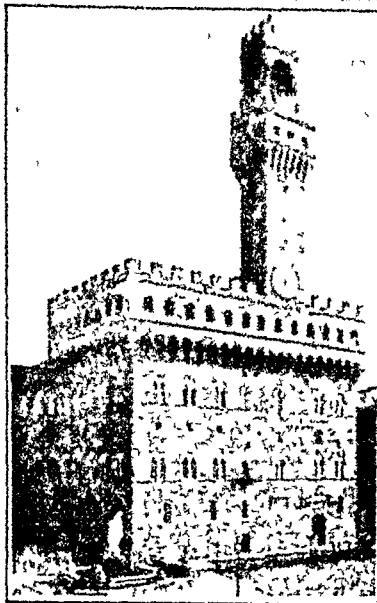
with cross ribs (ribs) and fan vaulting. Style introduced c. 1330 by the refectory of the choir and transept at Gloucester Cathedral with a Perpendicular overlay and seen in rebuilding and additions all over England as well as in new construction. Nave of Winchester Cathedral (1310-60) Bath Abbey central towers Canterbury and Gloucester West Tower Wall tower Magdalen College Oxford tower of Mount St. Mary's Abbey parish churches in East Angles and Somerset. Fan vaulting. Masters at Gloucester (1331) St. George's Chapel Windsor Henry VII Chapel Westminster Abbey King's College Chapel Cambridge Dorset and Ottery St. Mary etc.

*Tudor or Late Perpendicular* (16th cent.) including 17th cent. seen mainly in secular architecture. Large window rectangular or with flattened arch many gabled roofs with complex chimneys extensive use of brickwork and half timber much interior (especially linenfold) panelling. Style persisted into 19th cent. Many col-



Elizabethan Houses (Ford Hospital Cove try).

liger at Oxford and Cambridge, e.g. Corpus Christi and Wadham College, Oxford, King's Gateway and Great Court, Trinity College, Cambridge, London Hospital (half timbered), Coventry, Compton Wynyates, Hampton Court Palace (older portions), Sutton Place, near Guildford. Spain. Cathedral, Lerida, Tarazona. Sigüenza. Leon (founded 1199), Burgos (founded 1224), Toledo (founded 1227). Cathedral School



Florence, Palazzo Vecchio

Gerona, Barcelona (founded 1298), Palma, Majorca. Late Gothic Salamanca (new Cathedral, 1509), Seville (1402-1519, one of world's largest churches), Segovia (1520-77).

Germany, Austria, Bohemia, etc. Cathedrals Magdeburg (1208), Cologne (1248, W façade modern), Freiburg (1250), Ratisbon (1275-1307, W façade 1500), Prague (1344-85), Liebfrauenkirche, Trèves (1227), Elisabethkirche, Marburg (1235). Hallen-

kirchen (hall-type churches, apses same height as nave). Frankkirche and other churches, Nuremberg; Frauenkirche, Munich; St. Stephen's Cathedral Vienna (1340-1433).

Brick built churches. Marienkirche, Lübeck (1279), Düring (1347). Town Halls at Bremen, Lüneburg, Brunswick, etc., Holstentor, Lübeck.

Belgium and Holland. Cathedral at Malines (12th-14th cents.), Utrecht (1254-67), and Antwerp (1352-1474). Churches. St. Gudule, Brussels (1220-74), St. Pierre, Louvain (1425-97), St. Martin, Ypres (11th cent.). Town halls. Bruges (1380), Brussels (1410-13), Louvain (1418-63), Ghent (1449), Middelburg (1512), Ghent (1515-33). Brick churches. Grote Kerk, Haarlem (15th-16th cents.), Nieuwe Kerk, Amsterdam (1408). Cloth Halls at Ypres (1201-1304; rebuilt after World War), Bruges, etc.

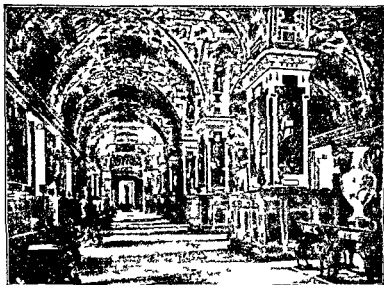
Italy. Gothic architecture was never really at home in Italy, as its structural basis was not fully understood. Italian architects clung to the principles of Romanesque construction and superimposed Gothic details ornamentally. Siena Cathedral (1220-1380), Palazzo Pubblico (1288-1309). Churches of St. Francis and Franciscan monastery at Assisi (1228-53), Campo Santo, Pisa (1278-83, by Giovanni Pisano), Orvieto Cathedral (1268-1330), Florence, Duomo (1298-1436, façade 10th cent.), Campanile of Giotto (1332), Palazzo Vecchio (1298), San Petronio, Bologna (begun 1300), Certosa di Pavia (1396-1465), Santa Maria del Carmine, Pavia (13th cent.); Milan Cathedral (1386-1431), Venice Doge's Palace (1324-63), Cà d'Oro (1422-40), Santa Maria Gloriosa del Frari (begun 1338).

RENAISSANCE—Italy. Period covers 15th-17th cents. Italy turned with relief from Gothic architecture to the long-neglected structure and decoration of Rome, but, thanks to her great architects, she created a new style out of Roman elements. This new style

lent itself especially to the design of palaces. New forms such as the placing of a dome on a drum were evolved.

Early Renaissance *Filippo Brunelleschi* (1377-1446) dome of cathedral Pazzi Chapel and Pitti Palace Florence — *Michelozzo* (1439-1494) *Riccardi Palace* Florence — *Leon Battista Alberti* (1404-1472) *Sant'Andrea* Mantua *San Francesco* Rimini *Rucellai Palace*

*Salvatore* San Zaccaria (1459-1515) palaces Venetian *Calergi* Dario Trevisan etc. *Donato Bramante* (1444-1514) *Santa Maria delle Grazie* and *San Sisto* Milan *Cancellaria* (1504) Palace Rome *Bramante* designed the new St Peter's the Loggia and other work at the Vatican High Renaissance (first half 16th cent.) *Antonio da Sangallo* (1483-1546) *Farnese Palace* work on St Peter's Rome — *Lattuada e Peruzzi*



Vatican Library

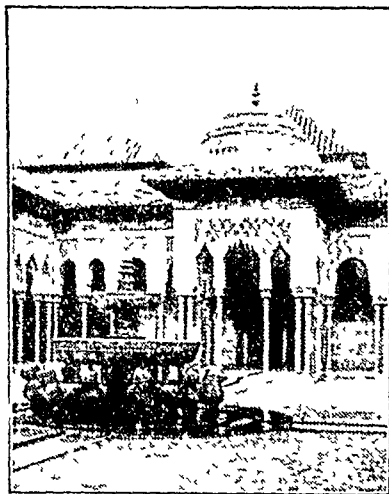
and façade of *Santa Maria Novella* Florence — *Benedetto da Majano* (1404-73) and *Cronaca* (Simone Pollaiuolo 1457-1509) *Strozzi Palace* Florence — *Giovanni di Dole* (d. 1498) *Sistine Chapel* Rome *Giovanni* *Antonio Amedeo* façade of *Certosa di Pavia* (1481-99) Work of the *Lombardi* at Venice (early 16th cent.) transitional between Venetian Gothic and Renaissance *Scuola di San Marco* *SS Giovanni e Paolo* San

(1481-1536) *Villa Farnesina* work on St Peter's Rome — *Michelangelo* (1484-1559) fortifications palaces *Porte Nuove* Verona palaces at *Montefiascone* *Orvieto* and *Venice* (including *Grimaldi Palace*) — *Michelangelo* (Michelangelo Buonarroti 1475-1564) architect of St Peter's Rome *Medici Chapel* and *Laurentian Library* Florence *Santa Maria degli Angeli* rebuilding on *Capitol* Rome — *Jacopo Tatti*



*Sansovino* (1479-1570) Library of St. Mark's, Venice — *Domenico Fontana* (1543-1607) Lateran Palace, Quirinal, Vatican Library

Late Renaissance (second half 16th cent.) *Giacomo Barozzi* (da Vignola, 1507-73) succeeded Michelangelo as architect of St. Peter's, Jesuit church, Rome, palace, Caprarola — *Giorgio Vasari* (1512-74) Uffizi Gallery, Florence — *Bartolommeo Ammanati* (1511-92) court of the Pitti Palace, Florence — *Andrea Palladio* (1518-80) Basilica, Palazzo della



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*Spain* Italian craftsmen brought into Spain to decorate Gothic cathedrals, etc., introduced the new style. At first used ornamentally hence "plateresque". Later on ornament is made subsidiary to function. Cathedrals, Granada and Valladolid, Santa Cruz Hospital, Toledo (1504), Ayuntamiento (Town Hall, 1527), and Lonja (Exchange, 1598), Seville, Escorial (1560-84). Portals to cathedrals and churches.

*Germany, Scandinavia and Holland* Renaissance architecture penetrated very slowly. Castles Heidelberg (wing of Otto Henry, 1556-59), Dresden (Georgsbau; 1530-36), Hartenfels Castle, Torgau (1532-44); Belvedere, Prague (1536), Town Hall, Rothenburg (1572). Frederiksborg Castle, Denmark (1602-20), Vadstena Castle, Sweden (1545), Town Hall, Amsterdam.

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**BAROQUE AND ROCOCO** (17th-18th cents.) leading to **NEO-CLASSICISM** (end of 18th cent.) *Italy* (Rome except where otherwise stated) *Carlo Maderno* (156-1629) façade of St Peter's — *Giovanni Lorenzo Bernini* (1598-1680) piazza colonnades St Peter's Scala Regia Vatican Palazzo Barberini — *Francesco Borromini* (1599-1677) Sant Agnese San Carlino alle Fontane Palazzo Spada — *Carlo Fontana* (1634-1714) San Marcello — *Filippo Juvara* (1685-1735) Basilica of La Superga Turin — *Luigi Vanvitelli* (1700-73) Royal Palace Caserta near Naples — *Niccolo Salvi* (1699-1751) Fontana de Trevi Rome

*France* Great building activity at beginning of 17th cent. Period of important town houses (hôtels) and country châteaux *François Mansart* (1598-1666) Hôtels Carnavalet Mazarin Château de Maisons St Germain-en Laye country houses Gaston Wing Blois — *Luxembourg Palace* Paris (1615) *Salomon de Brosse* church of the Sorbonne (Le Mercier) Versailles Palace (1661-84) — *Claude Perrault* (1613-1683) façades of the Louvre Observatoire Porte St Antoine — *François Blondel* (1618-80) Porte St Denis — *Liberal Bruant* (163-1697) Hôtel des Invalides — *Jules Hardouin Mansard* (1643-1709) Place Vendôme dome of the Invalides façades of Versailles Palace Grand Trianon town and country houses Landscape architect *André Le Nôtre* (1613-1700) gardens at Versailles Fortifications *Sebastien Le Nôtre* (1633-1700) Lille Arras etc

**Eighteenth Century** *Germain Boffrand* (1667-1751) Hôtel de Montmorency Paris cathedral Nancy château Lunéville — The great exponent of rococo was *Juste André Meissonnier* (1695-1750) who excelled also as an interior decorator and furniture designer — *Jacques Ange Gabriel* (1710-82) Petit Trianon Versailles Ecole Militaire and Place de la Concorde Paris — *Jean Nicolas Servandoni* (1695-1766) introduced neo-classicism

in church of St Sulpice Paris *Jacques Germain Soufflot* (1713-1780) Hôtel Dieu Lyons Panthéon Paris Town planning at Lyons Nancy Bordeaux etc — Churches of St Ouen Rouen and of St Etienne Caen

*Germany Bohemia and Low Countries* Bremen Town Hall (1612) — Augsburg *Elias Holl* (1573-1636) Town Hall — Vienna *Fischer von Erlach* (1656-1733) Karlskirche and Hofburg *Lukas von Hildebrandt* (1666-1736) Belvedere — Dresden *D. Pöppelmann* (166-1736) Zwinger Palace *Georg Bähr* (1666-1738) Frauenkirche — Munich Alte Residenz (1600-16) Residenztheater Church of St John Nepomuk (brothers *Adam*) — Würzburg *Johann Dalthausen Neumann* (1637-1753) Residenz — Potsdam *Georg Wenzeslaus von Knobelsdorff* (1699-1753) Sans Souci Palace — Berlin *Andreas Schlüter* (1664-1714) and *Friedrich von Eosander* (1670-1790) royal castle — Salzburg Cathedral (1614-68) and Mirabelschloss (1607) — Melk Convent (Jakob Prandauer) — Prague Wallenstein Palace (1673-1730) in sky Palace — Town Hall Amsterdam (1648-55) St Michael's Church Louvain (1650)

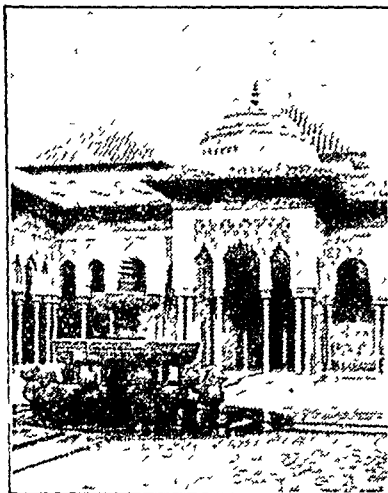
*Spain* The Baroque style in Spain is often called Churrigueresque after *José Churriguera* (1650-1735) characterised by ornament run riot Decorated doorways and altar pieces

*Sweden* *Nikodemus Tessin junior* (1654-1728) Royal Palace Stockholm

**England** **Seventeenth Century** First Half The Italian architectural conquest of England was due to *Inigo Jones* (1573-1632) His works include Banqueting Hall Whitehall (1622 the only completed part of his projected Whitehall Palace) St Paul's Covent Garden W Wing Greenwich Hospital façade Wilton House near Salisbury Raynham Park Norfolk Ashburnham House Westminster — *John Webb* (son in law 1611-1672) Thorpe Hall near

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# Architecture

289

# Architecture

*Piemonte* (1734-1808) Scala Milan  
*L. Cagnola* (1762-1833) Arco d'Italia  
Pace Milan

*France* Under Napoleon neo-classicism developed into the Empire Style  
Napoleonic architects *Pierre Fontaine* (1761-1833) *Charles Percier* (1764-1838) — *Barthélemy Lignon* (1782-1846) *Madeleine* — *Jean-François Chalgrin* (1739-1810) Arc de l'Étoile *Odéon* — *Eugène Emmanuel Viollet le Duc* restorations — *Charles Garnier* (1835-1893) Opéra — *Franz Christian Gau* (1790-1853) *Sainte Clotilde* Paris — *G. Davoud* (1833-1881) *Trocadéro* — *Jacques Ignat Hittorf* (1790-1867) *St Vincent de-Paul* Gare du Nord — *Alexandre Gustave Eiffel* (1832-1911) Eiffel Tower

*Germany* *Karl Gotthard Langhans* (1733-1808) *Brandenburger Tor* Berlin — *Heinrich Conrad* (1766-1811) *Prinzessinnen Palace* Berlin *Muséum* *Charlottenburg* — *Karl Friedrich Schinkel* (1781-1841) *Schauspielhaus* Old Museum *Werder Church* *Hauptwache* Berlin *Nikolaï Church* *Friedrich-Wilhelm* — *Friedrich Weinert* (1766-1836) *Castle* and other buildings *Karlsruhe* — *Leo von Klenze* (1784-1864) *Propylæa* and *Glyptothek* Munich also signed *Hermitage Museum* at *Leningrad* (St Petersburg) — *Gothic Revival* *F. von Gartner* (1778-1847) *Ludwigskirche* State library Munich — *F. Bürklein* (1813-1871) *Maximilianeum* Munich — *Renaissance Revival* *Gottfried Semper* (1803-1879) opera house and museum *Dresden* — *J. Paschdorff* (1833-1914) cathedral Berlin — *L. Hoffmann* (1813-1881) *Reichsgericht* (Supreme Law Courts) *Leipzig* — *G. Seidl* (1848-1913) *Bavarian National Museum* Munich — *Alfred Vessel* (1853-1909) *Wertheim's Stores* Berlin

*England* *Classical* *Henry Holland* (d. 1806) exponent of Greek revival — *Sir John Soane* (1753-1837) *Bank of England* country houses — *James Gurney* (1743-1831) *Courts* *Custom House* *Dublin* — *Herry William Inwood* (1784-1843) *St*

*Pancras Church* *London* — *William H. Stairs* (1778-1839) *University College* *National Gallery* *London* — *Sir Robert Smirke* (1780-1867) *British Museum* *London* — *George Bassett* (1794-1845) *Fitzwilliam Museum* *Cambridge* — *Harvey Lonsdale Elmes* (1813-1847) *St George's Hall* *Iverpool* — *Charles Robert Cockerell* (1788-1863) *Ashmolean Museum* *Oxford* — *Sir William Tite* (1792-1873) *Royal Exchange* *London*

*Italianate* *Albert Hall* *Government Offices* *Whitehall* *Geological Museum* (Great Hall *Euston* *Victoria Station* *Shrewsbury* (1831-1911) *New Scotland Yard* — *Byzantine* *John*



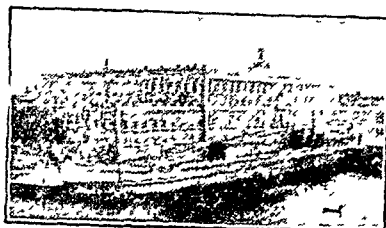
British Museum Front Portico

*Francis Bentley* (1839-1902) *Westminster Cathedral*

*Gothic Revival* *Austen & Welby Northmo & Pugin* (1810-1852) ecclesiastical architecture *St George's Cathedral* *Southwark* — *Sir George Gilbert Scott* (1811-1878) *St Giles's* *Camberwell* *St Mary's* *Edinburgh* *St Pancras Station* *London* — *Sir Charles Barry* (1793-1860) *Houses of Parliament* — *George Edmund Street* (1814-1881) nave *Bristol Cathedral* *Courts of Justice* *London* — *John Loughborough Parsons* (1817-1897) *Truro Cathedral* — *Sir Arthur William Blomfield* (1819-1893) nave of *Southwark Cathedral* — *Alfred Waterhouse* (1830-1906) *Natural History Museum* *London*

*Denmark* *Christian Fredrik Hansen* (1756-1845) *Vor Frue Church*

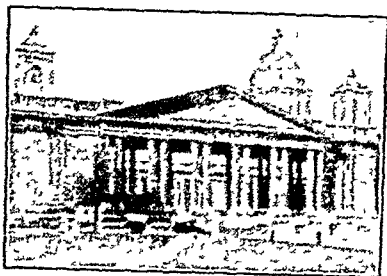
Peterborough Burlington House, Piccadilly London



Royal Palace, Stockholm

Seventeenth Century, Second Half  
The outstanding figure is *Sir Christopher Wren* (1632-1723). Among his earlier works are the library of Pembroke College, Cambridge, and the Sheldonian Theatre, Oxford. Wren's plans for London's complete rebuilding after the Great Fire of London (1666) were frustrated. St Paul's Cathedral (1675-1710) and over 50 city churches, rebuilding of Greenwich Hospital, Chelsea Hospital (1682), enlargement of Hampton Court Palace (1689), Library of Trinity College, Cambridge, etc.

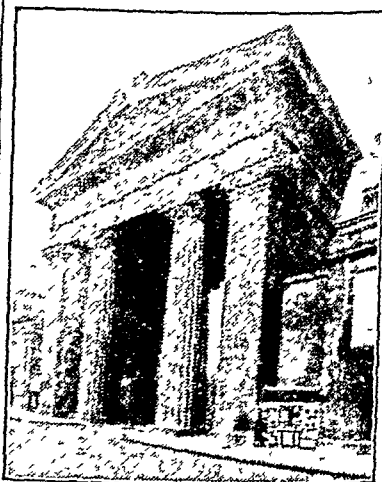
Eighteenth century, *Sir John Vanbrugh* (1666-1726) Blenheim Palace, near Oxford, Castle Howard, Yorks. — *Nicholas Hawksmoor* (1666-1736). Christ Church, Spitalfields; Queen's College, Oxford, W. façade and towers, Westminster Abbey (in Gothic



Greenwich Hospital

style) — *James Gibbs* (1682-1754) Radcliffe Camera, Oxford. St Mar-

tin's-in-the-Fields and St Mary-le-Strand, London, Milton House, near Peterborough — *Colin Campbell* (d 1734) McCreworth Castle, Kent (copy of Palladio's Villa Capra, see above) — *William Kent* (1684-1748), Lord Burlington's villa at Chiswick — *Lord Burlington* (1695-1753) — *John Wood* (d 1754) Prior Park and much work at Bath, Town Hall, Liverpool. — *James Paine* (1716-89) Kedleston House, Derbyshire — *Sir William Chambers* (1726-1796) Somerset House, London. *Robert Adam* (1728-



Classical Revival Euston Station, London.

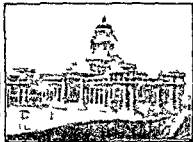
1792) and his brother James. Adelphi, London, and many other London houses. *George Dance* (1740-1823), Mansion House, restoration of Guildhall, London.

NINETEENTH CENTURY The 19th cent is a period of imitation or reproduction neo-classicism (introduced at end of 18th cent), eclecticism, Gothic revival, etc. It ends with the only new monumental style, the American skyscraper.

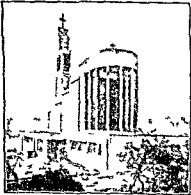
Italy *Giuseppe Valadier* (1762-1839), an exponent of classic revival. *P. Bianchi* (1787-1849) San Francesco di Paola Naples. *Giusepp*

of extremely rapid material change and scientific development conspicuously failed to do so. Presented with entirely new architectural materials and faced with the unparalleled requirements of a new age it fell back on either sham Gothic a style wholly remote from mechanical requirements or at best upon a development of the neo-classicism of the 18th cent. It was left to the 19th cent. to produce an architecture which should be true to the spirit of a scientific age and also accord with new ideas of health labour saving convenience amusement simplicity etc. This architect

way for modern skyscraper building. The end of the century however brought a reaction from this wholly



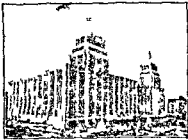
Palace of Justice Brussels.



Church of St. Charles in Prague

metal construction and a compromise was reached with the general adaptation of reinforced concrete invented by François Coignet in 1861 and of the ferro-concrete of Joseph Monier. These inventions made possible a school of architecture which may be described as hypocritical. The framework of buildings was now of iron or steel while a concrete facing or shell was deavoured to give them a familiarity borrowed from traditional styles. The neo-classical style even now persists as a superficial covering to metal framed buildings though its columns and

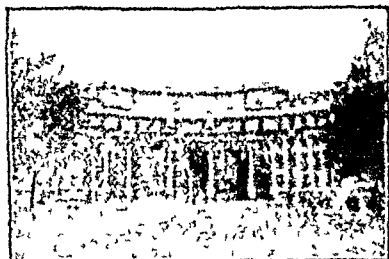
ture is even now only in its early stages of development. The beginning of modern architecture may perhaps be traced to the first extensive use of the new material cast iron in building construction. A few pioneers saw the possibilities and in 1830 Sir Joseph Paxton designed a huge building exclusively of glass and iron (the Crystal Palace) to house the Great Exhibition. For a time architects were influenced by the new structural possibilities at the expense of aesthetic considerations. In 1889 Eiffel built the Eiffel Tower 984 ft high of interlaced iron work in the Champ de Mars at Paris a structure which paved the



Kaiser Wilhelm Memorial Church, Berlin.

pediments contribute nothing to the structure. Only after the World War did modern architecture begin to develop an

Copenhagen — *Theophil Hansen* (1813-1891) University, Athens, Parliament House, Vienna — *M G*



London, Admiralty Arch

*Dan desboh* (1800-1850), Thorvaldsen Museum, Copenhagen — *Martin Nyrop* (1849-1921) Town Hall Copenhagen  
Belgium *L. Roelandt* (1786-1861) University of Ghent — *J Poelaert* 1817-1879) Palais de Justice, Brussels

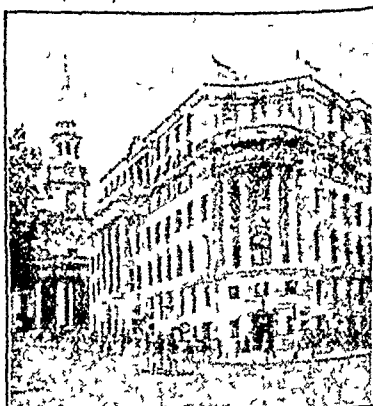
Holland *P Cuypers* (1827-1921) Rijks Museum, Amsterdam  
Russia *R de Montferrand* (1786-1858) St Isaac's Cathedral, Leningrad (St Peter-burg)

U S A With independence came a Roman revival State Capitol, Richmond, Va, copied from Maison Carrée, Nîmes Town-planning of Washington by *L'Enfant* (1751-1825), White House (1792) by *James Hoban* Greek revival, led by *Benjamin Henry Latrobe* (1766-1820), followed by Gothic revival (*Richard Upjohn*, 1802-1878), then by eclecticism The first sky-scraper appeared at Chicago World Building (1880), Wainwright Building (1890) by *Louis Sullivan*, 1856-1924)

TWENTIETH CENTURY Great Britain *Sir Aston Webb* (1849-1930) new front, Buckingham Palace, Admiralty Arch, London — *Sir Edwin Lutyens* (b 1869) Cenotaph Whitehall, Government House, Delhi, British Embassy, Washington — *Sir Thomas Graham Jackson* (1835-1924) New Examination Schools, Oxford, New Museums, Cambridge, Giggleswick School Chapel — *Sir Reginald Blomfield* (b

1850). domestic and civil architecture — *Sir Giles Gilbert Scott* (b 1880) Liverpool Cathedral, ecclesiastical architecture — *Sir John James Burnet* (b 1857). public and ecclesiastical work Freemasons' Hospital London (1933) — *Ralph Knott* (d 1931) London County Hall

Sweden Town Hall, Stockholm (b Östbergund, 1922) — Switzerland League of Nations Palace, Geneva (*J Hegenheimer* b 1880) — France Stadium, Lyons (*T Garnier*, b 1869) work of *Le Corbusier*, *Mallet-Stevens* etc — Holland *J B van Loghem* (b 1881), *W M Dudok* (b 1884), *J J P Oud* (b 1890) — Germany *Theodor Fischer* (b 1862, Ulm), *H Poelzly* (b 1869, Berlin and Frankfurt) *J Hoffmann* (b 1870, Vienna), *P Behrens* (b 1868, Vienna), *O Kaufmann* (b 1873, Berlin), *Eru Mendelssohn* (b 1887, Einstein Observatory, Potsdam), *F Hoegel* (b 1877, Chile House, Hamburg) — Finland *Helsinki* (Helsingfors) railway station (*E Saarinn*) — U S A Skyscrapers (industrial buildings hotels, etc)



South Africa House, London

Architecture, Modern An age generally expresses its spirit and its needs in the buildings which house its activities The mid-19th cent, a period

modern skyscrapers as the Graybar Building all decoration has been eliminated and reliance placed on cubic form a development encouraged by the legal and structural necessity of zoning. The psychological effect and functional convenience of the skyscraper has caused its adoption throughout the American continent even where conditions do not demand this form.

In Central Europe experiment has been very much more daring and modern architects have endeavoured to dissociate themselves completely from tradition in order to develop an architecture true to modern life. Mendelsohn, Kaufmann, Poelzig and Bruno Taut have eliminated all unnecessary decoration and endeavoured to bring out the beauty of functional form and line which is typical of the most advanced design. In the interior of the Universum at Berlin Mendelsohn experiments in the light effects obtained with curved surfaces while the huge communal blocks in Vienna are distinguished by colossal arches and bold changes of colour and surface texture. In Hamburg brick has been utilised in modern design and almost sculptural form while at Stuttgart the steel frame building is carried to its logical conclusion by eliminating the unnecessary stone shell and substituting glass. The globular steel and glass houses of this district would seem to carry the eccentricity of modern architecture to its extreme point.

The German experiments with form and surface combined with functionalism spread throughout Europe and developed into a new school in France where the modern genius Le Corbusier contrived to introduce a Gallic lightness of touch into the experimental earnestness of Teutonic architecture. Especially successful have been his experiments in small dwelling houses of reinforced concrete with large glass areas balanced by large areas of plain concrete the voids being arranged horizontally instead of vertically as in the American skyscrapers. These

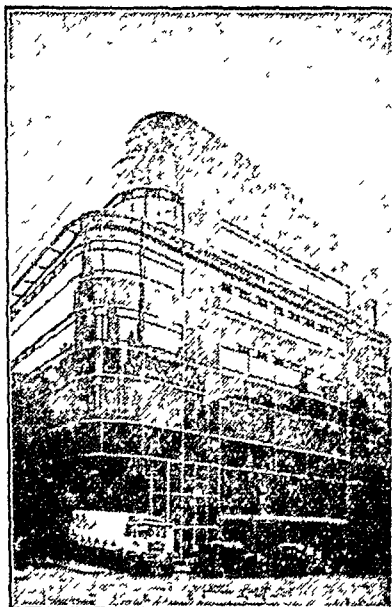
horizontal lines may be seen in the New Olympia and the New Victoria Cinema in London. They are used with extreme effect by the French architect Mallet Stevens whose economical cubic houses with their flat roofs in the street which bears his name in Paris have a distinctly Oriental effect and betray the influence of Al, ra and Morocco. A and G Perret's ferro-concrete and glass church of St Thérèse de l'Enfant Jésus at Montmagny conveys a lightness combined with strength reminiscent of the Sainte Chapelle.



Interior of the Daily Express Building London  
by Wright Little

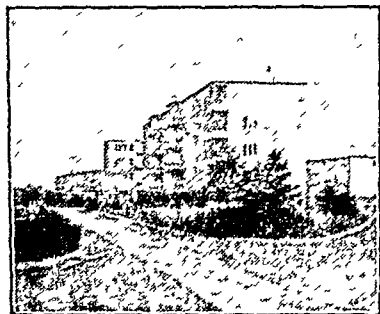
In England a compromise has been made between the soaring yet conservative style of American architecture and the daring play of form and material common on the Continent. In London a typical style of enormous concrete cubes their surface unbroken by either horizontal or vertical voids seem to be in process of development. Of this the cruciform Underground Station at St James's Park the vast mass of the Shell Mex building with its cubic clock tower flanked by conventional figures and the tiered hillside block in Savoy





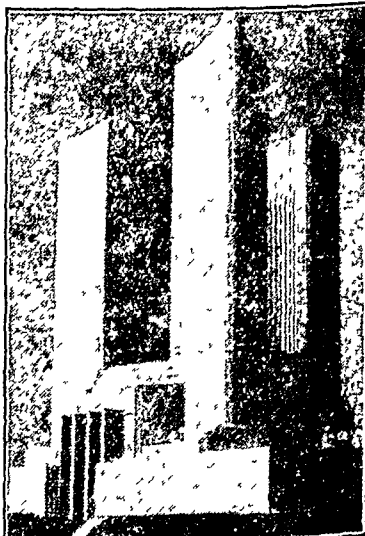
Daily Express Building, London

outer expression of its inner construction. The evolution of this new style was due to two main causes—the tremendous increase in the size of commercial and industrial buildings, and the demand for speed in building which tended to eliminate all un-



Houses without chimneys Mariendorfer Strasse, Berlin

necessary ornament. These have produced different results in different countries. In America, partly owing to enormous land values and rock foundation of the first experiments in New York, and partly, perhaps, to the aspiring nature of the Americans, the solution has been found in the "tower architecture of the skyscraper school. This development, apparently so radical, was in fact a product of necessity and has continued to be



The Government Buildings at the Chicago World Fair, 1933

governed by conservative ideas. The 800-ft. Woolworth Building, with its 50 stories, although a triumph of free engineering, was caked with sham Gothic ornament by an architect frightened by the severity forced upon him by new conditions. In cinema and the domestic architecture of California an extraordinary exuberance of baroque, Gothic, Indian, Chinese, Spanish, and even Maya and Egyptian styles have been introduced. American architecture is, however, beginning to emancipate itself, and in such

capitals of the Corinthian and composite orders

**Aisle** the portions of a church at the side of and parallel with the nave

**Apse** the semicircular or polygonal termination to the choir and aisles of a church

**Arch** a construction of brick or stone arranged in a curve and capable of sustaining weight (*see separate article*)

**Architrave** the lowest division of an entablature (*see below*) resting on the capital also used to denote the outer mouldings which enclose a door or window

**Atrium** a large apartment approached directly from the entrance hall or vestibule

**Baluster** earlier form of Baluster small pillar supporting a coping or handrail

**Balustrade** series of balusters together with the coping or handrail used as ornamental parapet to a terrace etc

**Base** the lower part of a column or pier

**Boss** ornament used for concealing the intersections of the ribs of ceilings vaulted or flat carved ornamental block as termination to the hood mouldings of doors windows and niches

**Buttress** a solid mass of masonry projecting from the wall to resist the pressure of arch or vault *See also below Flying Buttress*

**Canopy** an ornamental projection over a niche stall or window Decorated and Perpendicular periods

**Capital** the upper feature of a column or pier

**Chancel** that portion of a church intended for the use of the clergy and choir

**Chapter house** attached to the majority of cathedrals a meeting place for clergy and church officials

**Clerestory** in a church the upper row of windows above the roofs of the aisles by which the nave

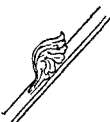
**Cloisters** covered passages connecting

the church with various parts of a monastic establishment

**Column** a vertical support composed of base shaft and capital The Doric column has no base

**Corbel** a bracket projecting from the wall to support a weight

**Crocket** an ornament in foliage form projecting from the outer moulding of a canopy or pinnacle



Crocket

**Crypt** the basement of a church often under the chancel only

**Cusp** projecting point in Gothic tracery

**Dentils** tooth like ornaments used in the moulding of Ionic and Corinthian Orders



Dentil

**Dome (or Cupol)** a hemispherical shaped covering over a circular or polygonal plan (*see separate article*)

**Dripstone** Hood Moulding, or Label an overhanging moulding over doorway window or niche to disperse rain

**Entablature** the portion of a classical building supported by a colonnade consisting of architrave frieze and cornice

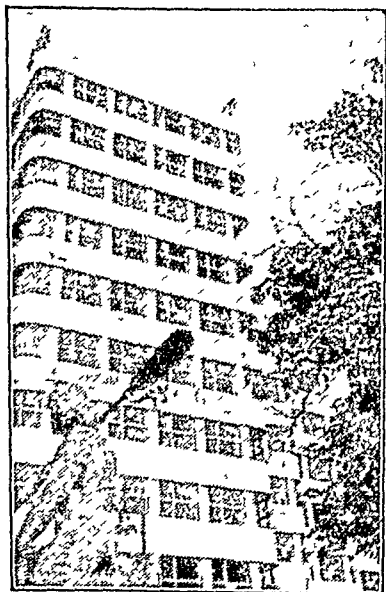
**Entasis** slight swelling on the shaft of a column to correct the illusion of concavity a feature of Greek temples

**Entastyle** classical name for architrave

**Exedra** semicircular recess often with hemispherical vault Unlike an apse (*q.v.*) it could be placed in any part of a building In classical times the exedra was often used as a hall of conversation

**Exade** front or main face of a building

Street, are typical. These are, however, developments from the earlier and more conservative Bush House, built under American influence. The transitional compromise with old forms is seen in the Masonic Building in Great Queen Street.



The Rhenania Ossag Haus, in the Tiergarten quarter of Berlin

The logical development of steel construction has taken a separate path from the monolithic concrete style, and the New Horticultural Hall at Westminster, with its soaring steel members used as interior decoration, has a modern airiness and aspiration. More striking still is the *Daily Express* building in Fleet Street, which, while still retaining the cubic form, with bevelled corners, has used for wall structure a huge expanse of black opaque glass held in place by "Birmalbright" strips. A spacious entrance hall gains a great sense of dignity as well as of modernity by the use of black marble and stainless steel,

while the elliptical staircase contributes a series of flowing but controlled lines, to complete this daring essay in the use of new materials.

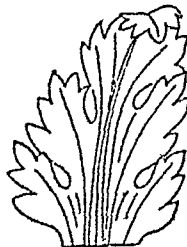
Domestic architecture in England with a few individual exceptions, has been conspicuously uninfluenced by modern tendencies, and the best productions are beautiful and ingenious adaptations of Georgian work. Some interest however, attaches to the slum rebuilding schemes in Cumberland Market and off York Road, Lambeth. In theatre architecture, great strides have been made under the alternate influences of florid American and stark German design. The Cambridge Theatre, with its interior use of sweeping curves and its avoidance of angles and straight lines, creates a calm and flowing effect. The use of huge exterior reliefs on the new Saville Theatre is interesting, while entirely new ground has been broken with cubist and modernist use of brickwork at the Stratford Memorial Theatre, reminiscent of Hamburg.

The universal touchstones of modern architecture include functional suitability, the elimination of superimposed decoration, the manipulation of form and line, experiment with new material, and the incorporation of modern hygienic ideas of light and air. If these characteristics have not yet produced an architecture worthy and typical of the age, it is inevitable that they should do so in the near future.

**Architectural Terms, Glossary of.**  
Abacus the flat stone on the top of

a column which bears the weight of the entablature. In the Doric Order it is square, in Gothic varied in shape.

Acanthus leaves of a plant conventionally used in Classical and Renaissance architecture and found on



Acanthus.

1.  $\alpha \in \mathbb{R}$  is a real number.



AMERICAN BISON AND CALF AT THE LONDON ZOO

**Fan Vaulting** system of vaulting, typical of Perpendicular Gothic, in which the ribs spread out like a fan. The earliest English example is at Gloucester (cathedral cloisters)

**Fascia** flat band or strip of stone, etc., between two mouldings

**Fenestration** arrangement of windows (Latin, *fenestra*) in a building

**Fillet** a small flat band on or between mouldings

**Finial** the carved decoration at the top of a canopy, pinnacle, or bench

**Flying Buttress** free-standing buttress bearing one end of a half-arch, the other end of which is connected with the main wall of a building, the object being to carry the thrust of a vault across an open space. A decorative as well as structural feature of Gothic, especially French Gothic, architecture

**Foil** leaf shaped space between two cusps in Gothic tracery, as in trefoil, quatrefoil, etc.

**Frieze** the flat portion between the architrave and the cornice, usually decorated with sculpture

**Gable** a triangular expanse of wall bounded by the two sloping sides of the roof

**Gargoyle** a carved projecting water spout, usually grotesque

**Groin** the angle formed by the intersection of vaults, usually ribbed

**Hemicycle** semicircular structure, generally roofed with a half-dome (see Exedra)

**Heptastyle** building with seven columns at its narrow ends

**Hood Moulding** see Dripstone

**Impost** the moulding on the top of a pier or column from which the arch springs

**Jambs** the side masonry or woodwork of doorways, windows, etc.

**Keep** central and most strongly fortified part of a mediæval castle. Examples of the square Norman keep are Rochester and White Tower, Tower of London (both by Gundulph), and Arundel. The best-known example of the circular keep is at Windsor Castle,

**Keystone** the central voussoir, or wedge-shaped block, at the top of an arch

**Lantern** a comparatively small structure (often octagonal) rising above the roof with windows or openings to admit light and air.

**Lath** narrow, thin strip of wood used in building, to form a basis for plaster, tiles, or slates

**Lierne** ornamental rib, additional to the structural ribs in vaulting

**Lintel** the horizontal stone or beam over a door or window.

**Lucarne** dormer window, especially one in a spire

**Machicolation** opening in the floor of a projecting gallery or parapet at the top of a wall or tower, enabling the defenders to hurl missiles or pour boiling liquid upon the attackers

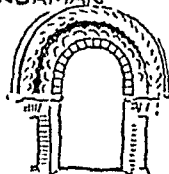
**Metope** slab (often adorned with sculpture) filling the space between the triglyphs in a Doric frieze

**Minaret** slender tower adjoining or attached to a mosque, from which the faithful are summoned to prayer

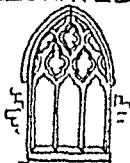
**Misericord** small projecting bracket under a hinged seat in the choir of a monastic church, to allow a slight rest when standing

**Moat** ditch or trench, generally filled with water, encircling the wall of a fortification or castle

NORMAN



DECORATED



EARLY ENGLISH



PERPENDICULAR



Windows, mullions and tracery



brick over any space (see separate article)

**Architrave** [ARHKITRĀV], in architecture (1) the lowest part of the entablature resting directly on the abacus of the columns (see ARCHITECTURAL TERMS, GLOSSARY OF) In the Doric Order it is a single block, in the Ionic it is formed of three stepped blocks, (2) moulding above and on either side of the top of the opening of a door or window

**Archon**, chief magistrate in Athens and certain other states in Ancient Greece The King Archon was the lineal successor to the older Kings, but as democracy gained power his position and importance diminished, until his duties became entirely ritual

**Archytas of Tarentum** (c 428-347 B C), Greek mathematician, opened up the field of scientific mechanics and produced valuable theories on progressions and proportions Of Archytas as a philosopher very little is known, except that he was a friend of Plato

**Arcot**, Indian city, on the R. Palar, in the Madras Presidency. Clive seized the fort in 1751. The French took the town 7 years later, and in 1760 it became British again by conquest. For a period it again reverted to a native ruler, Hyder Ali, but in 1801 Arcot fell again to the British. Having lost its trade, all that remains of its past grandeur is a mosque and a few tombs.

**Arcot, Siege of.** Arcot was taken on Aug. 30, 1761, by British and Sepoys under Clive from the Nawab, who offered no resistance. From Sept. 23 to Nov. 14 Clive, with a garrison of 290, had to withstand a siege by the Nawab's army of 10,000. Under Clive, until relieved by the British Army.

**Arctic Ocean**, see ARCTIC

**Arctic Regions**, situated within the Arctic Circle, but the name is more applied to the N. Polar region the line of tree growth conditions are reversed in

the central polar region is a frozen ocean deepest (2000 fathoms) towards the centre and almost landlocked by the N extremities of Europe, Asia and America, with the continental islands of Greenland, Spitzbergen, Novaya Zemlya, and Franz Josef Land A considerable archipelago fringes the Arctic Ocean N. of Canada. Owing to the comparatively low salinity of the Ocean the water freezes easily

**Geology and Glaciation** See GREENLAND and separate continents

**Climate** The coldest areas in the Arctic regions are found in the interior of the fringing land masses (Alaska, Yakutsk), but owing to the considerable seasonal range of temperature cultivation is possible comparatively close to these zones of extreme winter cold, and the Arctic region as a whole, even in its severest mood, would appear to be some 20° F warmer than the Antarctic

**Flora and Fauna** The limits of tree growth are within the Arctic Circle in Canada and Siberia, and ferns, flowering plants, etc., are found on the tundra, by comparison with the austerity of the Antarctic the vegetation is rich The principal domestic animal is the reindeer The musk-ox is an important item of food Whales, seals, walrus, and polar bears complete the characteristic fauna

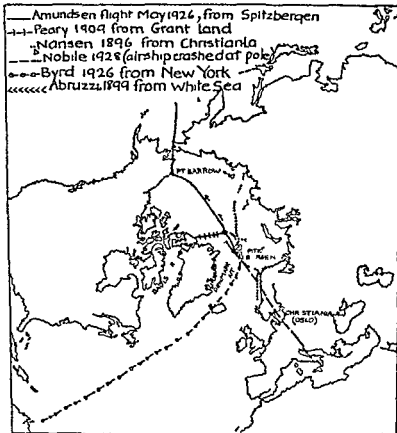
**Minerals** The Arctic region is known to be rich in minerals, and with the comparatively mild climatic conditions, their exploitation may be an economic

iron, and the coal, copper, have been reported known to exist

Alaska

Rates

polar ice-caps but although the Irish main channel communicating between the Atlantic and Arctic Oceans. After the 9th cent it was the Scandinavian the Renaissance exploration of these regions was actuated by the desire to



North Pole : Exploration.

upon the seas neighbouring the Arctic reach the Asiatic markets by a passage circle. They discovered the White NE of Eurasia or NW of America. It is possible that the English expeditions were stimulated by traders en



gaged in commerce with Iceland. In 1553 Willoughby sailed from Bristol to discover the N E passage, and one of his captains, Chancellor, reached the White Sea and opened up trade relations with Muscovy. The newly-established Muscovy Company was the principal agency through which the voyages of Frobisher (1576-8), John Davis (1585-7), Hudson (1607-10), Baffin, and Bylot (1616) were undertaken, as a result of which English exploration gradually penetrated N W as far as Baffin's Bay, explored the coasts of Greenland, and also advanced the exploration of the N E route. At the same period the Dutch were active to the N E, and Barents, who rounded the N of Novaya Zemlya, ranks among the greatest of the Arctic pioneers. Such exploration mainly instigated by the trading companies, continued until, towards the close of the 18th cent, the era of scientific exploration opened.

There were three main aims to pass the N E and N W passages, to clear up the topography of that region, and to reach the North Pole. The British were active in the N W, Parry and Franklin did much to elucidate the geography of the Canadian Arctic archipelago, in 1827 Parry made an abortive attempt to reach the Pole, Ross reached the N Magnetic Pole in 1831, and in 1846 Franklin actually sighted the N W passage, but died of starvation before the ice broke up. Subsequent attempts to ascertain his fate led to an enormous increase of knowledge concerning the Arctic coasts of America, but it was not till 1906 that Roald Amundsen actually sailed through the N W passage.

In the N E, Russian explorers, of whom Baron Wrangel was the chief, examined the whole Siberian coast early in the 19th cent. James Cook (1778) had sailed through Bering Strait (discovered by the Dane, Bering, in 1725), but the N E cape was not rounded until 1879 (by the Scandinavian A. E. Nordenskiöld). Parry's was apparently the earliest deliberate

attempt on the North Pole. He reached  $82^{\circ} 45' N$ . In 1895 Dr Nansen reached  $86^{\circ} 13' N$  on the expedition in which he engaged his vessel the *Fram* in the ice-pack in order to be drifted across the Arctic Ocean, this voyage made some of the most notable contributions to science in the history of Arctic exploration. In 1899-1900 the Duke of the Abruzzi's expedition reached  $86^{\circ} 34' N$ , but the conquest of the Pole was reserved to the American, Peary, who after a long series of voyages beginning in 1898 reached  $87^{\circ} 6' N$  in 1908 and the Pole 3 years later. In recent years the Pole has thrice been conquered by air. Commander R. E. Byrd flew over it in 1926, and the dirigible expedition of General Noble and Amundsen was successful in the same year. In 1928 General Noble again flew over the pole in an airship. Sir G. H. Wilkins and Lieutenant Eielson flew across the Arctic Ocean from Alaska to Spitsbergen in 1928.

*Arctostaphylos* (*Bear Berry*), an evergreen creeping plant having small white-pink flowers, followed by red berries. *Arctostaphylos uva-ursi* is the best known, and is useful for the rock-garden.

*Arcturus*, see CONSTELLATIONS

**Ardèche** [*pron* ARDASH'], department S E France, area, 2144 sq m, pop (1931) 282,911. It is mountainous, well watered, and for grandeur of scenery has few equals in France. Climate varies from warm and hot in the Rhône valley to cold in the hilly areas of the W. Agriculture, viticulture, and sericulture are prominent throughout. Privas is the capital; there are no large towns.

**Arden**, Forest of, Warwickshire, situated around the towns of Henley in-Arden and Hampton-in-Arden.

**Ardennes**: (1) District including parts of the Belgian province of Luxembourg, the Grand Duchy of Luxembourg, and the French department of Ardennes (see (2) below). It covers a portion of the ancient Forest of Ardennes, and forms the N buttress of the central European highlands to

between the valleys of the Rhine and Meuse. The Moselle valley forms the boundary. The hills are a much denuded mountain fold of sandstones and schists. The valleys are beautifully wooded and parts of the surface are fertile but the summits are barren and unimposing and in places covered by peat bogs. (2) Department of N.E. France comprising the French Ardennes and part of the Meuse valley. The hills are a wild forest but industry prospers in the valleys. Pasturage is important on the open ground about Sedan which also has woollen industries. Slate quarrying is important. The chief towns are Sedan, Mézières-Charleville, Rethel and Givet. The department occupies an important strategic position on the N.E. frontier of France and was occupied by the Germans from 1914 until the closing campaign of the World War. Area 2030 sq. m. pop. 93,700.

**Arditi, Luigi** (1821-1903) Italian musician studied at Milan and became a celebrated violinist. He was for some years after 1858 conductor at Her Majesty's Theatre in London. He composed *Il Bacio*.

**Ardrossan** port and police burgh of Argyshire S.W. Scotland about 30 m S.W. of Glasgow. Trade is chiefly with Ireland. There are docks and a shipbuilding industry. Coal and iron ware are exported and fisheries are of some importance. Pop. with the neighbouring burgh and watering place of Saltcoats c. 20,000.

**Areca**, a tall palm with thick rind fruits containing seeds used for various purposes. *Areca catechu* yields the betel nut and may be taken as the type. A palm grown in bothouses *Chrysalidocarpus lutescens* is sometimes referred to as the Areca nut palm.

**Arenga**, small palm trees from which sago, sugar and fibre are obtained.

**Areopagus** (A 110-0 p. 605) a hill some 370 ft. high in Athens to the N.W. of the Acropolis. It was the meeting place of the Council of the Areopagus which formed the advisory and deliberative body of the early

kings and the stronghold of aristocratic faction. The Solonian reforms (*see* Solon) curbed its powers. The hill called in the New Testament Mars Hill was the scene of the famous sermon preached by St. Paul which is described in Acts xvii.

**Ares** Greek god of war son of Zeus and Hera equivalent to the Roman Mars.

**Arête**, *see* GLACIATION MOUNTAINS.

**Arethusa**, a nymph of Greek mythology attendant on Artemis and changed by her into a stream when fleeing from Alpheus (*q.v.*)

**Aretino Pietro** (149-1556) Italian poet and writer of comedies. His great satirical gifts which caused him to be known as the Scourge of Priests led to his banishment. His name is associated with poetry of a scarcely restrained salacity. *See* ITALIAN LITERATURE.

**Arezzo** (1) Italian town situated on a hill nearly 1000 ft. high in Tuscany c. 50 m S.E. of Florence. It is the seat of a bishopric and the capital of a province and commune of the same name. Population town and commune (1931) 56,980. The town has many interesting memorials of the past including one of the rare Italian Gothic cathedrals and several Renaissance churches. Petrarch, Vasari and Guido of Arezzo were born there. (2) Province of Tuscany in W. Italy. The principal products are those common to the peninsula: wine and cereals. There are also important mining resources. Area 1210 sq. m. pop. (1931) 301,150.

**Argali** a large wild sheep represented by several local races inhabiting the mountain ranges of Central Asia. It is as large as an ordinary donkey and the rams carry enormous curled horns.

**Argand burner** a type of gas burner once very extensively used but now confined to certain types of gas radiators for domestic heating. The gas issues without previous admixture of air from a number of fine holes in a circular ring surrounded by a chimney.

now usually made of quartz. The gas burns with a luminous flame, but owing to the access of air thereto being promoted by the chimney, no soot is formed, the carbon being completely burnt.

**Argan Tree** (*Morocco Ironwood*), a low-growing, spreading, spiny bush of evergreen character, sometimes cultivated in greenhouses. A valuable timber tree, its fruit is used as food, and the kernels yield oil.

**Argaum, Battle of** (Nov 28, 1803) ended the second Mahratta War. The British under Wellesley defeated the Mahrattas.

**Argemone** (*Prickly Poppy*), a hardy annual with ornamental foliage and poppy-like flowers. *Argemona grandiflora* is white, *Argemona mexicana* is yellow.

**Argent**, see HERALDRY.

**Argentine, The** (*Republica Argentina*), the most progressive of the S American States, lies in the S E of the continent between the Andes and the Atlantic Ocean, having Bolivia on the North, Paraguay, Brazil, and Uruguay on the N E, and Chile on the W and S W. The Argentine Republic comprises 14 provinces, 1 federal district, and 10 territories. Its greatest length is c 2,100 m, and the greatest breadth some 900 m. Area, 1,080,000 sq m.

**Commerce** More than half the export trade of the Republic is in agricultural produce (grain, linseed, flour, vegetable oils). Next in importance are meat (especially frozen meat), live stock, wool, hides, dairy produce, fats, etc. Timber is a valuable item, but minerals are not important. The chief articles of consumption are textiles, motor-oils, foodstuffs, iron and steel, coal, paper, and other manufactured goods. The unit of currency is the gold peso, worth four shillings at par. Argentina receives somewhat less than one-third of her total imports from Great Britain, and about one-sixth of her total exports are sent to the same country. At least half of the foreign capital invested in Argentina is British,

and trade relations with Britain have become so close that Argentina is said by some to be economically within the British Empire. The Prince of Wales visited Argentina on a trade mission in 1931, and in 1933 a new trade agreement was reached with the representatives of the Republic after a conference in London.

**Communications** There are c 25,000 m of railways open, of which some 5,500 m are under Government control, including the two trans-continental routes across the Andes. The most important railway system, that centring on Buenos Aires, is operated mainly by British capital, the French owning c 1000 m of line in the province of Santa Fé. There are some 75,000 m of national telegraph lines, a privately-owned telephone service, and two wireless telegraphy companies.

**Coastline** The Atlantic coast of Argentina is c 1600 m long. There are relatively few good natural harbours. Bahia Blanca is perhaps the best. The great estuary of La Plata has been developed by artificial harbours built at considerable expense, and to this outlay is due the remarkable growth of the ports of Buenos Aires and La Plata.

**Relief** The Republic is divided into two strongly contrasted regions. The cordillera and plateau of the Andes occupy from one-third to one-quarter of the country on the West. The remainder of Argentina is a great plain sloping gently from the Andean foothills to the Atlantic. The N of this plain is wooded and swampy (Gran Chaco), the centre is a great natural grazing (the pampas), and S of Rio Negro is the frigid and barren region of the Patagonian steppes. The mountains are of much lower elevation S of Rio Negro, but very heavily glaciated in the South. Mercedario (22,300 ft), and Tupungato (21,600 ft) in the N are the highest summits in Argentina. Aconcagua (23,000 ft) is partly in Chile and partly in Argentina.

**Rivers** The principal rivers unite to form the estuary of La Plata the main streams the Paraná Paraguay and Uruguay drain the Brazilian plateau S into Argentina receiving the Pilcomayo from the Bolivian plateau The Pilcomayo forms the N E frontier of the Republic for c 400 m before joining the Paraguay The estuary of La Plata is some 100 m long and from 25 to 60 m in breadth There are nearly 9000 m of navigable water in the La Plata system Other rivers are the Rio Negro (400 m) and the Colorado draining the Andes E to the Atlantic both are navigable

**Climate** Most of Argentina lies within the S temperate zone and the climate is equable sunny and healthy A small area in the N lies within the torrid zone and in Patagonia the mean temperature becomes progressively colder S of Rio Negro in Santa Cruz the mean temperature is little above freezing point Rainfall is heaviest in the Gran Chaco region the districts of the N W are very arid and almost rainless

**Flora** The N regions of Argentina have a tropical and sub-tropical forest remarkable for the various native hardwoods (algarrobo quebracho rose wood walnut and lignum vitae) The bark and timber of the quebracho are used for tanning and for the manufacture of railway sleepers respectively Dye plants are numerous in the N forests Yerba maté tea tobacco sugar and cotton are also cultivated in this region The N W regions are a saline semi-desert clothed in a sparse thorny scrub (cacti etc) The pampas has no indigenous growth of trees but many foreign trees (acacia eucalyptus) have been planted and thrive there The pasture of the pampas is divided into native grass (*pasto duro*) and cultivated grass (*pasto blando*) the latter is steadily supplanting the former There is a rich temperate forest both deciduous and coniferous in the S Andes and the valleys are well

vegetated The Patagonian steppes are barren and treeless

**Fauna** The most diverse fauna are found in the wooded regions of the N where the wild animals peculiar to tropical S America abound Flocks of vicunas alpacas and llamas graze the Andean slopes and the plains of the pampas form one of the great stock raising areas of the world Wild pigs foxes skunk and deer are found in various parts of the lowlands but the Southern plains are as poor in animal as in vegetable life Tierra del Fuego has an Antarctic fauna on its S coasts

**Minerals** Petroleum is the only mineral which is exploited to any extent (13 000 000 barrels were produced in 1931) although many minerals are known to exist there is little mining

**Population** The inhabitants of the Republic are mostly European in origin The Indians have almost died out (c 30 000 are left) and are now practically confined to the N districts The early Spanish conquerors intermarried with the natives but the Argentine authorities have deliberately stimulated European immigration Italians form a large proportion of the immigrant population but over 60 nations have contributed to the building up of what is in fact a new race The negro element is unimportant The chief towns are Buenos Aires (2 195 000) Rosario de Santa Fé (485 400) Córdoba (253 000) Avellaneda (15 600) La Plata (187 400) Santa Fé (175 300) Tucumán (13 600) Bahía Blanca (10 400) Pop est 1932 11 683 000

**Education** Secondary and technical education is well provided for and there are five universities

**Government** The constitution (dated 1853) is a modified version of that of the USA The President who must be native born is selected by an Electoral College itself elected by popular suffrage He governs with a Cabinet of 8 Ministers and has wider powers than the President of the

**Involution** The raising of a number to a power, *i.e.* multiplying it by itself, *e.g.*  $3 \times 3 \times 3$  or  $3^3$

**Logarithms** A short method of carrying out complicated calculations, and based on the theory of indices. See also ALGEBRA

**Lowest Common Multiple** The smallest number into which every one of a given group of numbers will divide exactly, *e.g.* 30 is the smallest number into which 3, 5, 6 will divide exactly, and is therefore the L.C.M.

**Mensuration** The calculation of areas. See also GEOMETRY

**Multiplication** A short process of adding a large number of the same quantity, *e.g.* adding 3, 3, 3, 3, 3, 3, 3, is the same as  $7 \times 3$ , because there are seven threes

**Percentage** (% or "per cent") So many parts in every 100, *e.g.* 5 per cent means 5 in every 100

**Practice** A process of multiplying in parts, *e.g.* to multiply £2 5s 3d by 34, multiply first the £2 by 34, then the 5s, then the 3d by 34, and add the results together

**Proportion** The proportion or ratio which one number bears to another is the result obtained by dividing the first by the second, *e.g.* the proportion of 3 to 7 is  $\frac{3}{7}$ , and is the same as the proportion of 6 to 14, which is  $\frac{6}{14}$

**Signs** The chief signs used in arithmetic are addition (+), subtraction (-), multiplication ( $\times$ ), and division ( $\div$ )

**Square** A number multiplied by itself, *e.g.*  $4 \times 4$

**Square Root** The square root of a number is that number which, when multiplied by itself, gives the original number, *e.g.* the square root of 16 is 4, since  $4 \times 4 = 16$

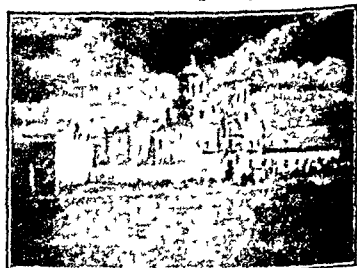
**Subtraction** The process of deducting one number from another, *e.g.* subtracting 3 from 7 leaves 4

**Zero** The figure 0

**Arius** (c. 256-330), a theologian who maintained that Christ was not co-eternal with God the Father. His doctrine spread, particularly among

the barbarians in Gaul and Germany, and was known as Arianism (*q.v.*) Arius was excommunicated, and the Council of Nicea (*q.v.*) pronounced against his doctrine

**Arizona**, State of U.S.A., situated in the S.W. of the Union between Nevada and Utah (N.), California (W.), and New Mexico (E.) The Mexican frontier is the southern boundary. The resources of this naturally desert area have been vigorously developed. The Roosevelt Dam feeds a vast system of irrigation, and agriculture (cotton, cereals, hay, and potatoes, dates and grape-fruit) is growing rapidly. The copper mines of the State are some of the largest in the world, and gold production is



Arizona, Spanish Mission of San Xavier del Bac (1892)

important. There are great alkali deposits (potash, nitrates) in the depressed areas of the State's surface which are part of an ancient sea-bed. The Painted Desert near the Colorado R. is distinguished by the vivid colouring of the sand, it contains a remarkable petrified forest. The tourist industry is of considerable importance on account of the grand scenery, which includes the Colorado plateau and neighbouring ranges in the Rockies; the Grand Canyon of the Colorado R. in this region is one of the landscape marvels of the world. There is a State University at Tucson; the chief town is Phoenix. Area, 113,800 sq. m.; pop. (increasing) was (1930) 435,600, including c. 44,000 Indians

**Ark** (1) A ship in which Noah (qv) took refuge from the Flood (2) The Ark of the Covenant a sacred chest among the Hebrews It is described in the Bible as containing the sacred stones on which the 10 com-



Convoy (Noah's Ark)

mandments of Moses were written It was thought that the presence of the Ark denoted the presence of Jehovah the Hebrew god and it was taken into battle The Ark disappeared before the destruction of the first Temple (3) The ornamented chest kept in Jewish synagogues in which the scrolls containing the Pentateuch are kept.

**Arkansas** [ARKŌNSAW] (1) State of U.S.A. situated inland to the W of the lower Mississippi between the States of Missouri (N.) Texas and Oklahoma (W) and Louisiana (S) Arkansas is mainly lowland but there are some mountain ranges (Ozarks) in the W The State is mainly agricultural cotton rice cereals hay and fruit and sweet potatoes are grown roses are widely cultivated for the manufacture of perfume The forests are valuable Cattle horses mules pigs and sheep are reared The chief minerals worked are coal bauxite and petroleum The capital is Little Rock Area 53 340 sq m pop (1930) 1 854 000 (2) Right bank tributary of the Mississippi rising in the mountains of Colorado and flowing E into the Mississippi at Napoleon in the State of Arkansas It is over 2000 m in length (3) *Arkansas City* town in Kansas USA situated on the N bank of the Arkansas R. near the Walnut R junction An important oilfield is in the neighbourhood which is also rich agriculturally The chief in-

dustries of the town are oil refining and flour milling and there are foundries and machine shops Pop c 14 000

**Arklow** ARK lō town and port in co Wicklow Irish Free State Explosives are manufactured and there are copper and lead mines in the neighbouring vale of Avoca but although there is an improved harbour the trade of the town supports a population of only 4 000 (1926)

**Arkwright, Sir Richard** (1732-1792) inventor of the spinning frame in early life a barber in Lancashire He constructed a spinning frame which gave hardness to the spun threads and patented the invention in 1769 after setting up a horse-driven frame in Nottingham He improved upon his invention in 1771 and 1775 Though the invention was unpopular with labourers its value was early recognised for its efficiency and economy

**Arlen, Michael** (b 1885) novelist born in Bulgaria of Armenian parentage His original name changed to Arlen by deed poll was Dikran Kouyoumdjian and he became a naturalised British subject in 1910 His works which are in the main satires on high society include *These Charming People* *The Green Hat* *Young Men & Love* *Lily Christine* and *The London Venture*

**Arles** [ARL] river port town of S France department of Bouches-du-Rhône situated on the left bank of the Rhône near the head of the delta The city is a river port connected by a canal to the Mediterranean There are textile and sausage manufactures and a trade in wine oil and fruit It is remarkable for its Roman antiquities which include amphitheatres and statues of Augustus and Venus Arles has played a prominent part in ecclesiastical history a bishopric was established there in the 1st cent and lasted till 1790 In the 10th cent Arles became the capital of one of the numerous evanescent Burgundian kingdoms Pop c 10 000

**Arlington, Henry Bennet, Earl of** (1618-1653) Royalist statesman who

left England during the Civil War and returned at the Restoration. He was Secretary of State (1662), a member of the Cabal ministry (*qv*), and Foreign Minister. He was impeached for corruption and Papal propaganda and, though the charge was not upheld, resigned his positions (1674).

**Arliss, George** (b 1868), English actor and film star. Arliss first appeared at the Elephant and Castle Theatre in *Vidocq*, 1886. His stage parts include that of Cayley Drummie



George Arliss

in *The Second Mrs Tanqueray* (1901), and the Rajah in *The Green Goddess* (1921), which he also played in the film adaptation. George Arliss appeared mostly in the USA from 1900 to 1922. He began his film career in 1920, and has starred in *Disraeli*, *Old English*, and *The Millionaire*. He wrote *Up the Years from Bloomsbury*, an autobiography (1927), and several plays.

**Armada, The.** In 1588 the "Invincible Armada," a fleet of 130 sail commanded by the Duke of Medina

Sidonia, was sent by Philip II of Spain against England. It was met on July 21 in the English Channel by Lord Howard of Effingham (Lord High Admiral) with 30 ships of the Navy and a large volunteer fleet. Many of the Spanish ships were destroyed; the remainder were driven N, of these a number were wrecked on the Scottish and Irish coasts, about 60 returned to Spain.

**Armadillo**, an American animal related to the ant-eaters, chiefly remarkable for its armour of bony plates embedded in the skin. It lives on the ground, feeding mainly on insects and carrion. Armadillos vary in size from that of a rat to that of a small pig, and are found from Texas to Patagonia.

**Armageddon**, a scene described in the Book of the Revelation (xvi, 16), where the kings of the World are depicted as gathering together for a last great battle before the end of the world.

**Armagh**: (1) County in N Ireland, situated S of Lough Neagh, and bounded by Monaghan and Tyrone on the W, co Down on the E; and co Louth in the S. The county is lowland in the N, but rises to boggy and rocky uplands in the S. The chief rivers are the Blackwater, the Upper Bann, and the Newry and Callan. There is some orchard culture and market gardening. Domestic linen weaving is the most important occupation. The chief towns are Armagh, Portadown, and Lurgan. Area, c 500 sq m, pop 110,100. (2) The county town of (1), a railway junction and market town, with distilling, leather, and linen industries. The see of Armagh is of great antiquity, and the Irish claim that it was founded by St Patrick. There are two cathedrals. Pop c 7350.

**Armagnac** [AR-MAN-YAK'], ancient province of France now mostly included in the Department of Gers. It was the most extensive fief in S Aquitaine, and the Counts became powerful and almost independent during the Hundred Years' War. Bernard of Ar-



SPANISH ART EQUESTRIAN PORTRAIT OF THE DUCA D' LIVARES

*By Yslaz (1 th Prod M J 4)*





ITALIAN ART MONA LISA  
*By Leonardo da Vinci. (In the Louvre, Paris)*



entirely of translations made in the 5th cent from Greek and Syriac Christian writers. During the succeeding centuries there was a considerable output of histories, homilies, and hymns. The first printed books appeared in the 16th cent. The 19th cent saw the development of the modern literary language, every branch of literature has been exploited, and, despite the political turmoil and unrest of the nation, a very large number of newspapers is now published in Armenian.

**Armentières** [AHRMAHTIÄ'R], French town on R. Lys, département of Nord. Textile manufactures were important from the Middle Ages until the World War. Armentières was close behind the British line during the greater part of the War, but was occupied by the Germans in 1914 and again in 1918. It was practically destroyed, but has been rebuilt, and is recovering its importance as a centre of woollen and linen industries. Pop. c. 18,000.

**Armes Parlantes**, *see* HERALDRY  
**Armillary Sphere**, *see* OBSERVATORIES

**Arminius**, or **Hermann** (c. 18 B.C. - A.D. 19), German national hero, defeated Quintilius Varus, Roman governor on the Rhine, and routed three legions in an effort to free his people from the Roman army. His defence discouraged Rome from a continuation of her military occupancy, but Arminius was later killed in conflicts with his own people.

**Arminius**, **Jacobus** (1560-1609), Dutch theologian and anti-Calvinist, studied at Leyden at the time of the War of Independence against Spain. He was Professor of Theology at Leyden (1603). Arminius founded the Arminian School of thought in opposition to the doctrine of predestination.

**Armistice**, a mutually agreed suspension of hostilities between two Powers engaged in warfare. An armistice may be temporary for a specific purpose, or may be a prelude to peace. A general armistice can only be

concluded by the Commanders-in-Chief with the consent of their Governments. Armistices in the World War: Russia-Central Powers, Nov. 20, 1917; Rumania-Central Powers, Dec. 7, 1917; Allies-Bulgaria, Sept. 29, 1918; Allies-Turkey, Oct. 30, 1918; Allies-Austria, Nov. 3, 1918; Allies-Germany, Nov. 11, 1918. The armistice with Germany was concluded by Foch and Wemyss for the Allies with the German delegates. Its terms included the withdrawal of German troops to a certain distance beyond the Rhine, the maintenance by Germany of Armies of Occupation, and the surrender of 10 battleships, 14 cruisers, 50 destroyers, all submarines, 5000 heavy and field guns, 30,000 machine-guns, 2000 aeroplanes, etc.

**Armistice Day**, Nov. 11, is observed annually in Great Britain, France, the Dominions and Colonies, and the U.S.A. to commemorate the cessation of hostilities in the World War at 11 a.m. on Nov. 11, 1918.

**Armorial Bearings**, heraldic compositions. *See* HERALDRY

**Armorica** (*land of the Armorici*), the former name for Brittany (*q.v.*).

**Armory**, *see* HERALDRY

**Armour**, *see* ARMS AND ARMOUR

**Armour Plate**, metal (steel) plate used to protect ships, tanks, forts, and other war material from action of gunfire, etc. Now usually consists of compound material (nickel and other special steel) hardened on surface. *See also* IRON AND STEEL

**Armoured Cars**, *see* TRANSPORT, MILITARY.

**Armoured Trains**, *see* TRANSPORT, MILITARY.

**Arms and Armour**. Primitive weapons can be divided into roughly 3 primary types: the club, the spear, and the projectile. The club, originally made of wood, with a knobbed end into which sharp fragments of shell, flints, or animal's teeth were frequently inserted, developed by way of the battle-axe and mace, and is to be found to day in the knobkerrie of Africa, the

shillelagh of Ireland the baton of the London policeman and the mace of the Speaker and the Mayor. The spear varied enormously in type and was used either for throwing or for thrusting. In Polynesia spears are generally pointed sticks rendered more deadly by rows of teeth or of shell fragments while in Africa they may be bifurcated or have broadened leaf like blades. The pike and the halberd of the Middle Ages the bill the lance the sword and the dagger are all modifications of the spear as is also the arrow which is merely a short slight throwing stick propelled by means of a bow. The projectile class of course includes the throwing spear also and such a weapon as the Australian boomerang but the throwing of a stone must have been one of the first methods used by primitive man in attacking his enemy or his prey. The sling and catapult brought mechanical power to reinforce human strength in hurling such weapons and in later times the arquebus began the process of the development of fire-arms which still continues to day and which is treated elsewhere.

As the offensive power of weapons increased methods of defence were invented to meet them and the most primitive savage tribes possessed some form of armour in the shape of a shield of bark woven grass wood or hide. Masks and helmets breastplates or jackets of similar materials followed while the ancient Persian Greek and Chinese fighters all wore heavy metal plates on breast back thighs and shins surmounted by helmets and supplemented by shields.

After the collapse of the Roman empire the mediæval warriors for a time protected themselves merely with padded materials or with leather though the wearing of chain mail which was common in the East was adopted by some of the wealthy nobles. Gradually the leather or padding was reinforced by plates of metal at certain points and this process developed until by the end of the 16th century complete suits of armour came into exist-

ence and knights and nobles went armed cap à pie. The company of armourers was chartered in the middle of the 15th century. The main difficulty facing the craftsmen was the production of armour sufficiently protective and yet not so cumbersome or clumsy as unduly to hamper freedom of movement this necessitated an



Body Defence in Trellised Steel Mask and Set the 16th Century.

intricate system of plates and joints, and a complete suit of armour consisted frequently of as many as 30 pieces.

In the 14th and 15th cents much of the armour made was extremely graceful and dignified in design, and the engraving and embossing which developed did not at first interfere with its functional fitness. But in the 16th cent the armour became almost fantastic in its elaboration and its imitation of civilian fashions, and its defen-

sive properties frequently suffered in the process.

Horse armour also developed from the 13th cent. onwards, until by the 16th the unfortunate chargers had nearly a cwt of metal to carry, in addition to that worn by their masters.

These elaborate metal costumes, however, were seldom worn by any but the great nobles and the wealthiest knights, no ordinary citizens being able to afford them. And as greater mobility came to be demanded of armies, and fire-arms became more effective, piece after piece of plate was discarded. The musketeers by the end of the 16th cent had abandoned all but the helmets, and by the middle of the 17th cent armour had practically disappeared except for show purposes and State occasions.

Survivals can still be seen in the breast- and back-plates of the horse guards and in the chain-mail shoulder



Suit of Fluted Armour (German, 16th Cent.)

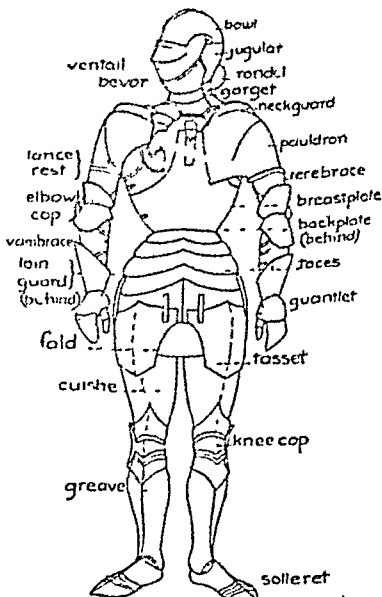


Diagram of Armour Parts

pieces worn by a few mounted regiments while the tin hats of the World War bear a considerable resemblance to the lighter types of mediæval morions.

Collections of armour can be seen in the Tower the Wallace Collection and at Hampton Court and in galleries museums and private mansions. Armour is highly prized by many European and American collectors and cleverly made forgeries are not uncommon.

**Army** an armed body of soldiers maintained for military protection or offence. The history of organised armies is as old as that of organised communities since the function of defence against marauding enemies was one of the first essentials of a settled people. Large armies of infantry and chariots were maintained in Ancient Egypt and also with the addition of cavalry in Assyria and Babylon. The Persians raised military science to a high level and kept a standing army which was supplemented by levies from each province. This tended however to be unwieldy from sheer size and the highly trained Greek infantry under Alexander with its phalanx of 16 000 spearmen was able to obtain many victories over it. In the 4th cent. B.C. the strain of maintaining citizen armies in Greece became very great and the citizen nucleus was supplemented with mercenaries. The Carthaginians under Hannibal made the Army purely professional the ordinary citizens no longer participating in it and even opposing its action on all possible occasions. Hannibal introduced a more flexible army and used cavalry to great advantage.

The Roman Army was first composed of volunteers from the richer classes but when payment to soldiers was introduced at the siege of Veii poorer men were enabled to join. The basis of the Army was the legion of 3000 heavy foot supported by 300 cavalry and 100 light infantry. It was very highly organised extremely loyal, and courageous in the rank and

file which received greater responsibility than hitherto. With the coming of the Empire however the patricians ceased to display any interest in the Army and it was composed more and more of mercenaries from the new provinces.

From A.D. 500 European armies returned to primitive tribal organisation which under Charlemagne began to develop into the feudal system an obligation by each baron or land owner to contribute a force from among his own tenants to the royal army. This plan however created no *esprit de corps* and the resulting armies of ill-equipped peasants proved very untrustworthy. The Crusaders improved military standards by keeping men under arms for a sufficient length of time for them to become trained and efficient. By the 14th cent. however armies were again composed of professional soldiers mostly pikemen and archers. *Free companies* developed chiefly composed of Swiss and Germans which would fight for anyone who required their services and for whom war was a permanent occupation.

The gradual improvement of artillery and of light fire arms in the 15th and 16th cents. began to make the heavily armoured mounted knights of earlier times obsolete and to cause them to be replaced by more lightly moving infantry. Typical of the new organisation were the Landsknechts raised by the Emperor Maximilian with trusted officers a high sense of discipline and loyalty and many of the characteristics of modern regimental practice. Meanwhile the idea of a national army was slowly developing especially in Spain from c. 1550 to 1650. A new body of armoured cavalry with pistols known as the *Reiter* was introduced as an offensive weapon against the solid ranks of pikemen.

The 17th-cent. Swedish armies of Gustavus Adolphus were raised by geographical levies according to population thus being gradually supplemented with mercenaries. After the end of the Thirty Years War (1618-48),

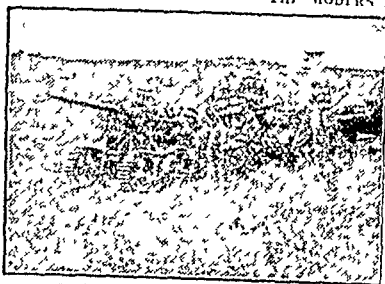
standing armies were maintained in almost all countries, and in the 18th cent these began to develop into modern forms with regimental units. Intensive training and iron discipline, introduced by Frederick the Great, laid the foundation of the efficiency of later German armies.

In 1798, Jourdan introduced conscription in France, and this compulsory military service of every citizen between 21 and 25 made possible the raising of army after army for Napoleonic campaigns. [This scheme was adopted in various forms by most other European Powers, except Great Britain, and still remains the basis of military organisation on the Continent. By training men for one or two years intensively, and then allowing them to return to their peaceful occupations, a

huge reserve force can be built up.

Meanwhile, the British Army continued to vary greatly in size according to the demands made upon it. About 18,000 was the normal peace time strength at the beginning of the 18th cent., and of these two-thirds were stationed in Ireland. This number was increased to 200,000 during the War of Spanish Succession and again at many subsequent dates. A period of continual and brilliant action on the Peninsula and finally at Waterloo was succeeded by nearly 40 years of comparative peace, with the exception of sporadic engagements in India. The Crimea found the Army out of date and out of touch with modern methods, and the subsequent period was devoted to making good this deficiency. The value of intensive train-

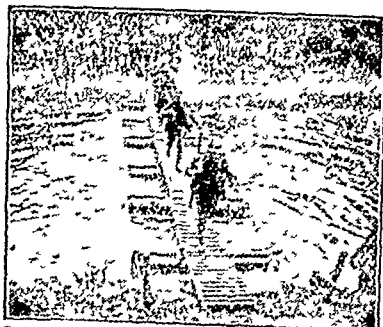
#### THE MODERN BRITISH ARMY



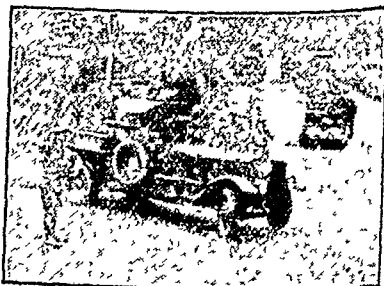
Field Gun with Caterpillar Tracks



Gas Masks and Machine Gun



Temporary Bridge, Royal Engineers' Construction.



Armoured Cars

ing and machine like organisation was proved by the success of the Prussians in 18 0-1 and many of its lessons were adopted by the British Army.

Experience of open fighting in wild country was gained in the S African War (1899-1901) but this proved of little value for the entirely new tactics of the World War (1914-18) which in the West after a few months manoeuvring settled down to trench warfare supplemented with heavy artillery bombardment.

**British Army Organisation** The Army is composed of three arms—the infantry cavalry and artillery. In modern times however the second of these has become of less importance and its place has been partially taken by a mechanised arm of tanks tractors and armoured cars.

The infantry is divided into regiments battalions and companies the cavalry into regiments squadrons and troops and the artillery (g v) into batteries. A company is usually commanded by a captain a battalion (of 4 companies) by a lieutenant-colonel and an infantry brigade (of 4 battalions) by a brigadier. This latter force consists of a total of 4000 men. The combination of a brigade of each arm is known as a division. A still larger combination forms an army corps and a number of army corps directed by one commander forms an Army. Reserves may be regular being liable to be called up at any time or auxiliary such as the Territorials who are only drawn upon in time of emergency. The Army owing allegiance to the King is actually administered by the Secretary of State for War and an Army Council (g v). In 1904 a Committee of Imperial Defence was formed with the Prime Minister as chief.

In 1932 the strength of the Army was as follows

Regular Army Home	99 000
Regular Army India	61 000
Regular Army Overseas	29 000
Army Reserve	1 4 000
Special Reserve	12 800
Territorial Army	150 000
	<u>67, AN</u>

The principal organised armies of the World in 1932 were as follows (in thousands)

Russia	562.0	Great Britain	159.0
Italy	462.2	Czechoslovakia	150.0
France	362.2	U.S.A.	145.0
Japan	2 00.0	Turkey	140.0
Poland	204.0	Yugoslavia	130.0
Romania	174.8	Germany	105.0

**Army Act** a statute passed each year by Parliament governing and regulating the Army. The struggles between King and Parliament in the 17th century and the fear that some person be he the King or a subject might make himself master of the Army and use it to subvert by force the legal rights and liberties of the people led to the passing in 1689 of the Bill of Rights which enacted that the raising or keeping of a standing army within the kingdom in time of peace unless it be with the consent of Parliament is illegal. As it was necessary however to have a standing army and to impose upon its members military discipline Annual Mutiny Acts were passed from 1689 to 1879 empowering the sovereign to maintain a specified army and to make Articles of War to enforce discipline. In 1879 the Army Discipline Act consolidated the provisions of the Mutiny Acts with the Articles of War and was replaced by the Army Act of 1881 which is a codification of military law (g v). This Act valid for one year is extended from year to year by the Army (Annual) Act which also after reciting the clause from the Bill of Rights permits the raising and keeping of a definite number of troops for the following year. One of the most important indirect functions of the Act is to render necessary the summoning of Parliament at least once every year.

**Army Corps** a formation commanded by a general officer and consisting of a number of divisions varying in accordance with the requirements of the commander-in-chief.

**Army Council** the body administering the Army and consisting of the Secretary of State for War Parliamentary Under Secretary of State for



War, Chief of the Imperial General Staff, Adjutant-General to the Forces, Quartermaster-General to the Forces, Master-General of the Ordnance, Financial Secretary of the War Office, and the Permanent Under-Secretary of State for War

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**Army-worm**, caterpillar of a moth, found in N and S America. Very destructive to crops. Masses of them march together when seeking new feeding-grounds, (hence name). Term also applied to the maggot of one of the fungus midges, found in Europe, which migrates in vast hordes from one place to another. See also PESTS

**Arndt, Ernst Moritz** (1769-1860), German patriot and writer. His hatred of France and Napoleon were expressed in his powerful poems and songs.

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1778), English composer, celebrated for the musical settings he arranged for songs from Shakespeare, and for plays and oratorios. He turned to music from law, producing his first composition at Lincoln's Inn Fields Theatre in 1733, and continued musical production up to 1775. His short settings include *Rule, Britannia!*, *Blow, Blow, Thou Winter Wind*, *Under the Greenwood Tree*

**Arnhem**, Dutch town, capital of the province of Gelderland, situated on the right bank of the lower Rhine. It has a thriving trade, principally in textiles and tobacco. In the Middle Ages Arnhem was a member of the Hanseatic League. Later it came under Spanish and then French rule. Pop (1932) 79,300

**Arnhem Land**, see NORTHERN TERRITORY

**Arnica** (*Lamb's Skin*) Medicinal plant of showy aspect for the rock-garden, from the roots and leaves is prepared an irritant tincture much used for wounds and bruises. *Arnica montana* is the garden plant, having large orange-yellow flowers. Grows under trees where few plants would blossom

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Poona Sanskrit College His poems earned him a wide reputation the best known being *The Light of Asia* (1879) a colourful and sympathetic epic of the life and teachings of Buddha

**Arnold, Matthew** (1822-1888) English poet and critic In 1831 he was appointed inspector of schools and his study of various methods of education especially the German bore very useful fruit in this country From 1837 to 1867 he was Professor of Poetry

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was capable of executing a perfectly chiselled lyric and the noble epic diction of *Sohrab and Rustum* cannot be gainsaid but the fundamental seriousness of his outlook on life debars him from a very wide popularity His work as a literary critic of permanent value and students of literature will always find his *Essays in Criticism* *Literature and Dogma* and *On Translating Homer* indispensable to an understanding of their subject

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**Aromatic Compounds** organic compounds whose structure contains a six (or more) membered ring The parent hydrocarbon is benzene  $C_6H_6$  the name was given to them because the first of these substances to be investigated was obtained from natural sources having a pleasant odour See also CHEMISTRY

**Aronet**, see VOLTAIRE

**Arquebus** a 16th-cent. fire arm originally supported on a forked rest and fired by a match It was used by the Spanish at Lavia (1575) improved in 1530 and c. 1570 developed into the musket

**Arrack**, see SPIRITS

**Arraignment**, the procedure whereby in a criminal trial the prisoner is called to the bar of the court the indictment read to him and he is asked to plead guilty or not guilty

**Arran**, large island near the mouth of the Firth of Clyde county of Bute Scotland It is very mountainous culminating in Goatfell (880 ft) The glens (Glen Sannox Glen Rosa) are of striking beauty Loch Ranza is a fine sea loch in the N of the island Game and fish are abundant, and the island is much frequented by tourists Sheep and cattle are raised Length c. 70 m greatest breadth over 10 m Area c. 160 sq m The chief villages are Brodick, Lamlash and Corrie For. 890

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Stuart kings. **JAMES HAMILTON**, 1st Earl (c 1475-1620), a grandson of James II of Scotland, was president of the regency council (1617-20). **JAMES HAMILTON**, 2nd Earl (c 1515-1575), was protector of the realm and a regent for James VI. He provoked a short and unsuccessful war with England. **JAMES STUART**, 4th Earl, followed an insane 3rd Earl in 1681, and was for a short time Lord Chancellor of Scotland.

**Arrangement, Deed of**, an agreement under seal for the settlement of property, commonly employed between debtors and creditors to allow of liquidation of the debts by arrangement with the creditors.

**Arras**, town of NE France on R Scarpe and capital of the department of Pas-de-Calais. It is a very important market for agricultural produce, and has some thriving industries, hosiery, dye, oil, and iron manufactures being the chief. Arras is a junction on the railway from Amiens to Lille. In the Middle Ages the town was capital of Artois (qv) and part of the industrial area of Flanders, although under French rule after 1194. It was famous for its tapestries. The town passed to the Habsburgs in 1493, but was recovered by France at the Peace of the Pyrenees, 1659. During the World War it was almost wholly destroyed (see ARRAS, BATTLE OF). Pop c 26,000.

**Arras, Battle of** (April 9-May 5, 1917), began the Allied offensive of 1917. As a result important German positions were captured and their line pushed back considerably, but with a heavy cost in lives. This battle was not an unqualified success, as the preparations had prevented any element of surprise.

**Arrest**, the seizing of a person to compel his appearance before a court of law. Except in cases of treason, felony, or breach of the peace, no arrest can be made on a Sunday. A private person is bound to arrest anyone who commits a felony in his presence, and may arrest anyone

whom he finds committing an indictable offence at night. Police officers may arrest without a warrant for treason, felony, or breach of the peace committed in their view, or in any other case by warrant. A warrant for arrest can be issued by any justice of the peace upon a sworn information or complaint in writing, and should specify the person to be arrested and the charge.

**Arrest of Ship (law)**, admiralty process whereby a defendant's ship is attached, & detained, as security for any sum awarded to the plaintiff. It is applicable in cases arising from damage, bottomry, salvage, and seamen's wages.

**Arrest of the Five Members (1642)**. Charles I tried to arrest Pym, Hampden, Haselrig, Strode, and Holles, Members of Parliament active in resisting his illegal actions. They escaped to the City.

**Arrhenius, Svante August (1859-1927)**, Swedish physicist and chemist, studied at Upsala and Stockholm, showing brilliant originality in the field of physical chemistry. Thus, however, earned only a poor reception at the time. His investigations covered a wide field, including electrolysis, astronomy, and biochemistry. Arrhenius was Lecturer and Rector at Stockholm University, and Director of the Nobel Institute for Physical Chemistry from 1907 till 1927. In 1903 he was awarded a Nobel Prize, and was elected FRS in 1910.

**Arriaga, Manoel José d' (1839-1917)**, first President of the Portuguese Republic (1911), entered politics in 1882 after a brilliant scholastic career, was a leading Republican, and was actively concerned with the 1910 revolution. Arriaga resigned in 1915.

**Arrian, Flavius (c 95-175)**, Greek historian, Governor of Cappadocia under the Emperor Hadrian. A *History of Alexander the Great* and philosophic writings of his are extant, though much of his work has been lost.

**Arrol, Sir William (1839-1913)**, Scottish constructional engineer, and

MP from 1891 to 1906 His firm specialised in building bridges the most famous being that over the Nile at Cairo the Tower Bridge London and the Forth and Tay Bridges

**Arrowhead (*Sagittaria*)** an aquatic plant with arrow shaped leaves and white flowers with yellow centres. There are several species. *Sagittaria variabilis* is the best for general culture. *S. montanaensis* can be grown in pots standing in water and is excellent for small garden pools.

**Arrowroot**, name of several plants from the roots of which a food-starch is obtained that is much used for invalids and infants. The ginger family provides species of *Maranta*, especially *Maranta arundinacea*, the plant usually styled arrowroot. Other plants amongst them *Mamhoi*, *Tacca*, *Zamia*, *Curcuma*, and *Nel* *inbo* *scifera* are the sources of an arrowroot approximating to *Maranta*. See CEREALS.

Arrow worm, a small transparent worm shaped marine animal of uncertain affinities, classified by itself in a group called the *Chaetognatha*.

**Arsenal**, a depot for the manufacture repair and storage of all war materials including ammunition artillery explosives small arms etc An arsenal is usually established in a safe base position and heavily fortified *British arsenals* Deptford Chatham Sheerness Portsmouth Plymouth Woolwich Enfield *French* Cherbourg Brest Toulon Bordeaux *German* Kiel Essen *Russian* Kronstadt Leningrad Sebastopol

**Arsenic.** For the characteristics of arsenic see **ELEMENTS**

Commercial arsenic is prepared by heating arsenical pyrites a mixed sulphide of arsenic and iron out of contact with air when the arsenic sublimes into the cool parts of the apparatus. Arsenic may also be obtained by roasting the naturally occurring sulphides so as to give arsenous oxide and reducing the latter by heating with charcoal, when again the arsenic distils off.

Arsenic is extremely poisonous and

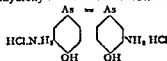
is much used for criminal purposes usually as the trioxide also known as *arsenious acid* and *white arsenic*. Yet of all poisons arsenic is the most easily detectable (by means of its hydride the Marsh test) and the symptoms of arsenical poisoning are characteristic and easily recognisable (vomiting intense thirst collapse).

There is a popular supposition that arsenic is good for the complexion and it is eaten in small quantities for these purposes by various peoples the most striking case being that of Styrian peasants. The human body will in time increase its tolerance for arsenic and habitual consumers can take an amount many times greater than a toxic dose with no apparent ill-effect. Habitual use however leads to symptoms of chronic arsenical poisoning such as neuritis

**Compounds of Arsenic** The most important compound of arsenic and the one that serves as the source of the majority of the others is arsenious oxide or arsenious acid  $As_2O_3$ , already mentioned above. This compound is obtained by the roasting of arsenical ores. It is useful as an insecticide and vermin killer.

An extremely important series of arsenic derivatives are the organo-metallic compounds that can be prepared from it. These find extremely valuable applications in medicine chiefly in the treatment of protozoal diseases such as syphilis and trypanosomiasis (African sleeping sickness).

The most important organic arsenical compounds are those of the aromatic series. Work on their therapeutic action was initiated by Ehrlich who prepared a large number of them the best known being salvarsan or arsphenamine (606) which is the dihydrochloride of *p*-dihydroxy *m*-diamino-arsenobenzene



Salvarsan was formerly used for the treatment of syphilis, but owing to its deterioration to a poisonous compound on exposure to air, it has now been superseded by neo-salvarsan ("914"), which is the sodium salt of the compound formed by the interaction of salvarsan base with formaldehyde sulphonylate.

Stovarsol, another arseno-benzene derivative, is stated to be active against syphilis and amœbic dysentery when taken by the mouth. Several other organic arsenical compounds of a similar type are employed in therapeutics.

**Arsonious Acid**, *see* ARSENIC

**Arsine**. Arsine or arseniuretted hydrogen is arsenic hydride,  $AsH_3$ , a colourless gas obtained by the action of nascent (i.e. in an active state) hydrogen on an arsenic compound. The gas has a smell of garlic, and is extremely poisonous. The formation of arsine is the basis of the well-known Marsh test for arsenic, which has figured in many criminal trials. The suspected matter is placed in a solution in which hydrogen is being evolved, the gases produced are led through a hot tube, the heat decomposes any arsine present in the gases, and pure arsenic is deposited on the tube in the form of a mirror. The test is extremely delicate.

**Arsis and Thesis** [*ῥίση* *arh-sis* and *θέσις* *thē-sis*] are terms used in Greek and other prosody signifying respectively the raising and setting down of the foot in the dances of the Greek chorus, those actions corresponding with the short and long syllables of the lyrics which were simultaneously sung. Hence the term arsis was applied to the short or unaccented syllable, and thesis to the long or accented syllable. But the terms were also used of the elevation or lowering of the voice with relation to the quantities of the different syllables. Hence their meaning became exactly reversed: the arsis (raising of the voice) coming on the long syllables, and the thesis (lowering of the voice) on the short syllables. In modern prosody, arsis is usually

applied to the accented and thesis to the unaccented syllable; though there is a tendency to return to their original applications.

**Arson** is the unlawful and malicious setting fire to the house, outhouse, building, crops, woods, etc., of another. Where the accused has set fire to his own house or property, an intention to defraud another, such as an insurance company, must be proved to constitute the crime. Arson is a felony. In Scotland it is called "fire-raising." *See* INCENDIARISM.

**Arsof, Battle of** (near Ascalon, 3rd Crusade, early in 1192), the English, under Richard I, after a desperate conflict routed 300,000 Saracens under Saladin and took possession of the town.

**Art** is the concomitant of an impulse to express one's personality in a form of activity. It is not the object or goal of exertion, that is, it is not an end in itself, but, when anything is done in a way which excites a certain kind of pleasure, called æsthetic enjoyment, art is present. It is thus a magical accident of personal endeavour, though, as will be seen later, the artist acts with premeditation.

In its widest sense Art may be present in any form of activity, thus, we speak of the perfumer's art, the art of cooking, or of the art of war, but in the modern restricted sense it is confined to what may be termed the Fine Arts. These are usually divided into Architecture, Sculpture, Painting, Music, Literature, and the Drama. Thus of the five senses only two, sight and hearing, are involved, though a blind individual may be able so to develop his sense of touch that he may derive some æsthetic enjoyment from running his fingers over a beautiful vase or over a finely-proportioned piece of furniture. The sense of sight is occupied with the arts of painting, architecture, sculpture, and poetry (when silently read); that of hearing with music, recited poetry, and wireless transmissions, a play acted before an audience involves both.

From the earliest times man has been impelled towards artistic creation. The cave paintings at Altamira in Spain dating from the Upper Palæolithic period are an outstanding example of the antiquity of this urge to create. From the Stone Age to the present day and in all countries civilised and uncivilised there has been a continuous impulse in man to express himself in forms of activity that are not strictly utilitarian. There has not however been a continuous development: the activity has rather been that of an ocean tide though the ebb and flow are very irregular. Generally speaking the artistic products of Palæolithic man were superior to those of his Neolithic successor the Palace Style vases of Knossos to those of the Geometric mainland style the *Hermes* of Praxiteles to the recumbent effigy of a Crusader and a masterpiece of Hepplewhite to a piece of furniture shown at the Great Exhibition of 1851. There has everywhere been between the extremes of birth and death a growth a flowering and a decay. All three periods may (but not always do) have their especial charm: autumn leaves and apple blossom are in their way as attractive as roses.

*Origin of Art.* When every race in every age is driven to do something that a strict utilitarian must term a pure waste of time the question naturally arises: What is this Art and whence does it come? The answer has occupied the minds of philosophers since men began to think. Plato regarded it as a form of play or pastime and thought it inferior to such occupations as agriculture, medicine and cookery which do at any rate produce something useful. In other words Art was not far removed from that mischief which Satan finds for idle hands to do. The English associationists developed the idea of play and traced the Fine Arts back to the spontaneous cries and movements of children. Schiller following Kant speaks of a play impulse between the conflicting impulses of form and

matter. Croce speaks of lyrical intuition (*see AESTHETICS*). Santa Vana of objectified pleasure. Another theory is to regard Art as the expression of divinity yet another as the superstitious conciliation of unknown gods. The last two theories will be shortly examined.

In the former case each individual is regarded as part of God or as possessing some divine flame which forces him to produce something eternal whatever the consequences and in total disregard of worldly praise blame profit or loss. In only a few favoured individuals does the flame grow hard and bright: these are the men of genius. In most people the flame is little more than a feeble flicker though even the humblest and most inconsiderable human beings are capable of producing at least one work of art however trifling. The work of art by whomsoever produced genius or dunce possesses the attribute and constitutes the expression of divinity. Its criterion is permanence: a work of art is immortal. But since it is contrary to reason for a mortal to produce something immortal it necessarily follows that the permanent immortal work of art is of divine or gign expressed through a human being.

The case for superstitious conciliation presupposes not only a continuous evolution of civilisation from savagery but a subconscious persistence of inheritance intact through that evolution—in other words a dynamic growth accompanied by a static terror. It is argued that a primitive folk frightened by the unknown gods who sent storm and pestilence attempted to conciliate them in a variety of ways which included drawing painting music sculpture and even a primitive form of architecture. Thus the Palæolithic scrawlings on reindeer bones and the Altamira frescoes are tributes to the unknown not the products of an idle hour and the savage war chants the grotesque idols and the primitive altars are all due to a desire to appease rather than to worship a jealous God.



Hence it follows that all the Fine Arts are originally religious. This theory might explain Stonehenge, Rouen Cathedral, or even the Ninth Symphony, but it leaves gaps which cannot be bridged. No subconscious tribal instinct can fully explain the colour of the *Night Watch* or the maddening smile of Mona Lisa.

*Nature of Art* Art is personal, premeditated, trained, disinterested, and permanent. That art is essentially personal hardly needs elaboration. The work of an artist, to an experienced eye, is as readily recognised as his handwriting. Anything therefore which is wrought by Nature independent of man, such as the exquisite patterns of hoar-frost on a window-pane, or the chance resemblances to human or animal figures on certain rocks, is not a work of art. That art is premeditated is not, perhaps, so clear at first sight, especially as we have said that art is not an end in itself. The idea of "inspiration," without which art is said to be impossible, seems to imply that the artist, like Shakespeare's poet, is possessed by a fine frenzy, which cannot be deliberate. But, as Wordsworth suggested, it is the frenzy recollected in repose that enables the artist to produce his work of art. If he tried to work during his paroxysm he would create a monstrosity. Shelley's skylark was not an artist, because his art was unpremeditated. The artist, therefore, having recovered from his frenzy, but still possibly in an "inspired" state of mind, calmly starts to work. His work is thus the result of deliberate effort, but it will not be great art unless it appears to be effortless and spontaneous. It is this that is meant when it is said that art lies in concealing art. But in order to achieve good work an artist must be trained. Any person may have a "natural bent" for painting, music, or architecture; but his latent talent requires to be drawn out by a long and tiresome process of specialised education. The man of talent benefits by this training, but the

dunce may be trained for years in vain. Art is disinterested, for the pleasure gives is not necessarily connected with usefulness. The true artist, even though he has the incentive of poverty and writes his symphony or paints a picture to keep himself from starving, is impelled to produce a work that, itself, is independent of his physical needs. If it is not, it is no longer work of art, but a potboiler. The absence of personal motives is perhaps better seen in the attitude of the spectator. The sympathetic visitor to a picture gallery or to a musical recital on seeing a portrait of Gainsborough or on hearing the *Fourth Ballade* of Chopin, experiences an aesthetic emotion that has nothing whatever to do with practical necessity.

The fifth great quality of art is permanence. Not only is it permanent but it is the only thing that is permanent. Practically the whole of our knowledge, e.g. of the Minoan and Mycenaean civilisations, is derived from their ruined palaces, fortresses and tombs (architecture), and from their vases, metalwork, gems, and statuettes (sculpture). The immortal products of mortal men are the living proof of that old Latin proverb: *art is long, while life is short*.

*Function of Art* Nature, in the widest sense, is the inspiration of art. It might therefore be said that the function of art is to copy or reproduce Nature, or, to adapt Aristotle (who was speaking of poetry), that it is "a kind of imitation." But this is not so, otherwise a sharp photograph of a landscape, with every detail accurately reproduced, would be perfect work of art, whereas a landscape painted by Turner or by David Cox, which includes only the details selected by the artist, and those very accurately drawn, would be inferior. But the reverse is the case. The Turner or David Cox water-colour is a work of art, while the photograph as such, is not, although no one would deny an element of artistic skill in a sympathetic photographer.

reason for the distinction is that the artist impresses his personality on to his subject and creates something of his own which is his art while the photographer does nothing of the kind. The artist is active the photographer passive. The one not only selects but gives something of his own to his subject the other takes what is given him. The logical process is one of analysis and synthesis. The artist chooses a subject which he mentally takes to pieces (analysis) he then puts the pieces together (synthesis) in his own way but he does not necessarily use up all the pieces and he may even introduce some new pieces from elsewhere. In the process of putting together he creates something entirely new and in this new creation lies art. If there were nothing new there would be no art. This does not mean that art is false. Nothing which does not bear the imprint of truth can be a work of art but truth to nature does not imply photographic reproduction. The most bizarre achievements of the Cubists and Expressionists if inspired by sincerity are true artistic creations (The danger in this case is the possibility of insincerity which only an astute critic can detect). Given the duty of an artist to realise himself in his work and to create something new out of his subject matter there is no logical objection whatever to the artist's creation bearing little or no resemblance to the object represented. The objection is rather æsthetic if there is no æsthetic enjoyment (and the spectator must equally pass the test of sincerity) there is no art.

*Art and Science.* Therefore art may be said to lie in making something new and personal. It is thus distinguished from science which aims at co-ordinating and applying knowledge based upon the accurate observation of facts. The popular idea is that art does while science knows. But there is really no such clear-cut distinction especially in some branches of the Fine Arts such as architecture. Art being premised as we have seen cannot

supervene unless the artist knows what he is doing an architect cannot design a safe building unless he is a scientist as well as an artist. Sir Christopher Wren was both. Conversely there is nothing to prevent a scientist from co-ordinating his facts in an artistic manner. Sir Isaac Newton was both scientist and artist.

*Art and Beauty.* It has been said that there is no beauty or ugliness in Nature but that beauty and ugliness are creations of man in other words that beauty lies in the eyes of the beholder. A sunset over Lake Derwentwater is not intrinsically beautiful nor is Saturday night in a squalid district intrinsically ugly. The only really ugly things are those created by man and even these are only relatively ugly. The mid Victorian settee which we despise to-day was considered handsome or elegant when it was made it therefore was handsome or elegant. The limpid round eyes of a European beauty are considered hideous in China they therefore are hideous in China. Thus the sense of beauty is both historical and geographical the position of an object in time and space determines its æsthetic worth. This is the real reason for fashion. While a thing is in fashion it is æsthetically acceptable when it goes out of fashion it is ugly when it is greatly out of fashion it acquires an antique value and again becomes beautiful. It is necessary however to assume that its craftsmanship is above reproach as a badly made object is never beautiful in any age. Now the function of the artist is to use the material of the world in such a way that out of it he creates a work of art. This work of art gives us æsthetic enjoyment and is therefore called beautiful. The most unpromising subjects can be made beautiful in the hands of an artist even the uninspired work of other human beings who are not artists. Not only did Rembrandt create beautiful paintings out of hideous old women but a

French impressionist made a Thames railway bridge into a joy for ever. Adversity finds sermons in stones, the artist (as well as the lover) sees Helen's beauty in a brow of Egypt. Not only so, but he induces the spectator to see the beauty as well. Thus the artists are the great missionaries without them we should have no sense of the beautiful at all.

*Art and Craftsmanship* We have seen that unless the artist can acquire skill, he will not create a work of art. But it is necessary to guard against the converse notion that if a man acquires great skill he is necessarily an artist. Unless the will to create is present the skilled artificer will remain a craftsman. Many so-called artists are merely accomplished craftsmen. A craft such as metal-working or furniture-making demands highly trained manual dexterity, but not necessarily æsthetic perception. If a craftsman has æsthetic perception he is an artist. Paul Lamerie, Riesener, Chippendale, and the Adam Brothers were definitely artists. In a sense all artists are craftsmen, for otherwise they would be unable to execute any work at all, but crafts are usually put under the heading of "applied art," as if all art were not applied art.

*Art and Utility* Though æsthetic enjoyment has no necessary connection with utility, it does not follow that utility has nothing to do with art. Architecture, for example, is concerned with both. In the first place, a building is usually designed for use and not for ornament. If it is properly designed according to scientific principles and is thoroughly convenient for its purpose the chances are that it will be beautiful. But the addition of meaningless colonnades, sculptures, and ornaments will not make a building beautiful. It immediately becomes meretricious. The architect is in error if he says, "We will attend to the use first and put the beauty in afterwards", so is the pianist if he learns a piece of music first and "puts the expression in" afterwards. The connection between

science and art can be seen in almost any branch of applied science. A well-designed locomotive or motor-car chassis is artistically beautiful because it is scientifically correct. As a general rule, anything that "looks right" (i.e. gives æsthetic enjoyment) is scientifically correct. Most of the applied arts, such as furniture, ceramics, and glass, have a very decided reference to utility. But painting, sculpture, music, and poetry are only incidentally (if at all) useful. A statue of Cæsar, as well as his mortal remains, might "stop a hole to keep the wind away," and the *Marseillaise* may have revived the spirits of a retreating army. But in general art is at its best when it is thoroughly useless, provided it is not meaningless as well.

*Art and the Spectator* Throughout this short enquiry two points of view have been evident—the artist's and the spectator's. It is often said that an artist never knows which is his best work, and that, in consequence, æsthetic enjoyment is virtually a monopoly of the spectator. But the spectator may not be idle: he requires training as well as the artist. Some people are said to have an instinct for appreciating works of art, this may be so, but it needs educating. A pagan suckled in a creed outworn might start for hours at Rubens's *Descent from the Cross* without appreciating its colour, harmony, and proportion, a city magnate might sit in one of Hepplewhite's noblest chairs without any feeling other than that it was "infernally uncomfortable." But if the pagan or the city magnate has in him the divine flame, he may in time learn to appreciate and to enjoy the creations of the artist.

Artabanus, the name of four Parthian kings and of a group of Persian princes and leaders, between the 5th cent. B.C. and the 1st cent. A.D.

Artaxerxes, the name of three Persian kings of the 5th and 4th cents. B.C. Artaxerxes I (465-424) was a son of Xerxes. Artaxerxes II (404-359) succeeded Darius II. His brother

Cyrus in revolt was defeated at Cunaxa in 401 the Persian fleet led by the Athenian Conon destroyed the Lacedæmonian fleet at Cnidos in 394 Persian influence in Greek affairs was shown in the Peace of Antalcidas (386) Artaxerxes III reigned 359-338 B.C.

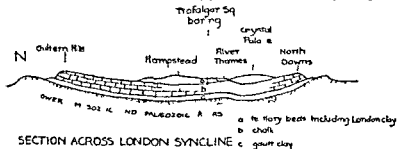
**Artemis** a goddess of Greek mythology corresponding to the Roman Diana. Early legends describe her as the goddess of the moon and of hunting of chastity nature and agriculture and of healing in some of these she is associated with her twin brother Apollo. As goddess of nature she watched over crops fruits and beasts. Ephesus was a centre of her cult.

**Artemisia**, queens of Halicarnassus

rock should lie between two impermeable layers. The water cannot then escape from the rock and has to flow along the bed. By boring through the impermeable bed above the water may be tapped at any part of its course provided that the mouth of the well is below the level of the original source of the water.

The fountains in Trafalgar Square were formed by artesian wells the water from the Chiltern Hills on one side and from the Downs of Surrey on the other flowing along the chalk and collecting in a basin under London.

In this case the retaining beds of impermeable strata are the Gault Clay (q) below and the London Clay (q1) above and by boring through the



Artesian Wells.

(1) Queen c. 480 B.C. joined Xerxes in his expedition (480 B.C.) against the Greeks and took an active part in the battle of Salamis. (2) Ruler from 353 to 350 B.C., after the death of her husband Mausolus in whose honour she erected the Mausoleum one of the Seven Wonders of the world.

**Arterio-Sclerosis**, see BLOOD VESSEL DISEASES OF

**Artery** see CIRCULATORY SYSTEM

**Artesian Wells** artificial bores made through an impermeable stratum of rock to reach water-bearing beds below so named from their being largely used in the French province of Artois.

The conditions which make this possible are that a bed of permeable

litter a gush of water was obtained. No longer owing to the number of private wells sunk by laundries, breweries and other factories the water pressure has been so much diminished that artificial pumping has to be resorted to.

The water in artesian wells may rise from a great depth in which case it usually has a high temperature. At Crenelle near Paris water gushes to a height of 3 ft above the ground and is at a temperature of 81° F. A well near Budapest sunk to a depth of over 3000 ft yields water at a temperature of 161° F. In America at Pittsburgh a depth of over 4000 ft has been reached.

Artesian wells are most useful how

ever, in desert country. They have been sunk in S. Algeria, Egypt, Persia, China and other places, but are perhaps most used in the dry regions of Australia, where it has been asserted that water at practically boiling-point has been obtained from a depth of over 4000 ft. In 1924 there were estimated to be 2000 such wells in Australia, with a daily flow of 451,000,000 gallons. The water is slightly saline, and is used for watering cattle, driving water wheels, etc.

The term "artesian well" is sometimes wrongly applied to a well in which pumping is necessary. See also SPRINGS, WATER SUPPLY.

**Arthritis**, an inflammatory condition of the joints. Its causes are very numerous, and while some are known to be due to micro-organisms, and some to the presence of poisonous or toxic substances in the blood, there are many types of arthritis where the cause is unknown and successful treatment very difficult. See also JOINTS.

**Arthropoda**, a phylum, or main division, of the animal kingdom, including such forms as the crabs, spiders, and insects. The Arthropoda resemble the worms or annelids (*q v*) in having the bilaterally symmetrical body typically composed of a series of segments and traversed by the alimentary canal, beneath which lies the double nerve cord. In both phyla this nerve cord encircles the gullet in front and terminates in the so-called "brain," or nervous swelling in the head, and the main part of the circulatory system runs above the alimentary canal. Arthropoda, however, differ from annelids in having distinct limbs, which are usually jointed, typically a pair to each segment of the body. Usually one or two pairs of these limbs are situated in front of the mouth, and are then generally modified as feelers or antennae, and at least the first pair behind the mouth is typically associated with it as jaws.

A link between the higher annelids and the Arthropoda is furnished to some extent by *Peripatus* and its allies,

which form an ancient primitive group. In these the legs are short unjointed outgrowths of the body resembling the limb-like outgrowths of the bristle-footed worms, and at the base of each opens an excretory organ resembling the similar organ of the worms. On the other hand, *Peripatus* resembles the centipedes, millipedes, and insects in having a single pair of antennae on the head, and in its method of breathing by means of fine tubes (tracheae), which permeate the tissues and open on the skin; their apertures, however, are numerous and irregularly scattered, not few in number and paired, as in the other classes of Arthropoda.

These primitive forms are grouped together as a class Prototracheata, which is found in all continents except Europe, but mostly in the S. Hemisphere.

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**Arthur**, and **Arthurian Legend**. To what extent King Arthur was an historical personage is a question of curiously little importance, and is likely to remain unanswered. What is important is that this legendary British chieftain is the nucleus around which has grown up the romantic cycle of legends associated with his name and those of his knights. Legends in which there is plainly some substratum of historical fact, but which have been so intermingled with and enriched by elements of the older Celtic mythology, that the task of analysing the fact and the myth in them is of interest only to a few enthusiastic researchers. The earliest mention of King Arthur is by Nennius (*q v*) in his *History*, and the cycle of legends concerning Arthur and the Round Table developed through the work of Geoffrey of Monmouth, Wace, and Layamon, and the prose romances

of such writers as Chrétien de Troyes. There has been a sharp division of opinion as to whether the main origin of these legends lies in Brittany or in Wales and there is plenty of substantiation for each theory.

**Arthur Chester Alan** (1830-1896) Republican President of the U.S.A. (1881-6) successor of Garfield (*qv*). He carried through administrative reforms during his term as President, passed the 1883 Tariff Act repealed many stamp duties and improved communications.

**Arthur Prince** (1486-1509) eldest son of Henry VII of England married Catherine of Aragon (later the wife of Henry VIII) but died before his father the succession passing to Prince Henry (afterwards King Henry VIII).

**Artichoke** The true artichoke usually called the Globe artichoke is a plant bearing large heads of scale-like leaves whose fleshy bases are eaten as a vegetable delicacy. It is a native of Italy said to have been introduced into England in the reign of Henry VIII.

**Jerusalem Artichoke** belongs to the sunflower family and produces root tubers which have a high starch content and considerable food value with a pleasant smoky taste. The plant will grow on almost any soil but prefers a deep loam in an open situation.

**Articles of Association**, *see* COMPANY

**Articles of War** *see* ARMY ACT

**Artificial Respiration**, *see* FIRST AID

**Artificial Silk** (or *Fayon*) is the name for artificial textile fibres made from a cellulose (*qv*) basis. There are four chief varieties of these all depending upon squirting the solution of cellulose or cellulose esters through very fine jets and immediately solidifying it by various means. The earliest process was that invented by *Chardet* and makes use of cellulose nitrate dissolved in a mixture of ether and alcohol which is very volatile and evaporates as the mixture issues from the jets or spinnerets as they are called. This would be useless as a textile as it is exceedingly inflammable but it is easily

denitrated by a solution in water of sodium hydrosulphide NaHS.

The *cuprammonium process* consists in dissolving waste cotton previously treated with caustic soda and bleached in cuprammonium. Sugar and starch are added to the mixture to stabilise it and the fibre is squirted into either an alkaline or acid bath in either case the cellulose solidifies.

The *viscose process* makes use of the xanthogenate. The cotton or sulphite wood pulp is brought into a cylinder with a strong solution of caustic soda whereby some of it is dissolved. A plunger fits the cylinder and after treatment for 3 or 4 hours the pressure is applied to squeeze out two-thirds of the contents. The residue is beaten up in a mixer until it is reduced to grains which are then kept warm for 2 or 3 days with the object of allowing a certain amount of oxidation to take place. This may be facilitated by adding a little sodium peroxide. The mass is then mixed with carbon bisulphide whereby the xanthogenate is formed and the transformed solid is then dissolved in caustic soda. The solution then stands for 2 or 3 days the sulphur mainly separating out. The liquid is filtered several times and the air is removed by subjecting it to a vacuum. It is then forced through a spinneret into an acid coagulating bath of a very complex composition containing salts of sodium and ammonium as well as glucose starch and other carbohydrates.

The *acetate process* employs purified cotton converted into acetate by acetic and sulphuric acids and dried after careful washing with alkali to remove all traces of acid. It is then dissolved in acetone and squirted through the spinneret into the air the acetone evaporating. The material is particularly difficult to dye and it has been found necessary to develop new types of dyes for this purpose. If a fabric is made of it and another type of fibre, the latter may be dyed with a colour which will not take on to the acetate. The latter can then be

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**Roman conquest** As a border province Artois experienced a radical change of overlordship in the Middle Ages. At first a fief of the Count of Flanders it passed by marriage to the French Crown in the 12th cent. Later it formed part of the domains of the Valois dukes of Burgundy from whom it passed to the Habsburgs. It was recovered by France in 1659 at the conclusion of the Franco-Spanish War.

**Art Schools**, in the exact sense of the term are of comparatively recent development. Painting and sculpture in the early stages of civilisation were productive and creative processes like building or pottery making and the artist was apprenticed to his trade like any other craftsman. Well known artists whose work was so popular that they could not cope single-handed with the demand had assistants whose training began with the purely technical rudiments of grinding pigments and preparing surfaces and later consisted of actual work on the paintings or models of their master. Rubens was an outstanding example of such a master. Later certain painters opened institutions purely for the purpose of teaching and private schools of this character still exist to-day. But they exist side by side with the much more important official art schools supported by Government or local council grants and controlled by public bodies.

The Royal Academy Schools opened in London in 1768 and have continued ever since. The Royal College of Art at St. Kensington began life in 1837 as a school of Design and became the Department of Science and Art in 1883. Five years later it passed under the control of the Council of Education as the National Art Training School. The Slade School of Drawing, Painting and Sculpture is a part of the University of London and one of the most important and highly regarded schools in the country. The L.C.C. conducts numerous technical institutes where training in the fine arts is provided: those at Lambeth, Westminster and in Southampton Row

are the most important. In all provincial cities and towns of any importance there are art schools generally conducted by the municipalities. The Parisian art schools—*L'École des Beaux-Arts*, *L'Académie Julian* and *La Grande Chaumière*—are the best known and most widely frequented in the world, students coming from America, Australia and all parts of Europe to undergo or complete their training.

### Art Terms Glossary of

- Agnus Dei** (Lat.) [AGNŪS DĒI] literally Lamb of God the representative of a lamb with flag and cross.
- Altar screen** the partition between the High Altar and the Lady Chapel.
- Amalctus** an ornament or figure in high relief in sculpture or carving. The figures project from the base to the extent of more than half their depth.
- Anaglyph** [ANAGLIF] a work of art which is sculptured, chased, carved or embossed in low relief.
- Angleterre Point d'** [PUNCT D'ANGLÈTÈRE], a mode in England during Charles II's reign by Flemish workers.
- Arabesque** style or ornamentation derived from the Moors or Arabs painted, incised or carved in low relief. The patterns are of a fantastic nature and may consist of interlaced foliage or scroll work.
- Argive** [ARĠIV] a school of sculpture contemporaneous with the Attic school (qv).
- Aureole** **Aureole** [ŌR EŌLA EŌL] the halo which is depicted as surrounding the head of Christ, the Virgin or the Saints.
- Bambino** (It.) [BAM BĒ NO] literally baby in art usually the representation of the infant Jesus.
- Bamboccianti** [BAM BOCH FAN TA] a style of genre (qv) painting practised by Teniers, Wilkie etc.
- Bas relief** [BAS RĠLĠEF] in sculpture figures or designs which project but slightly from their background.
- Bazel** [BĒ ZEL] the oblique face



with another special substance. This material has been greatly improved, though originally it suffered from the great drawback of losing strength when wet. As made it has a high lustre, but this can be removed to any extent as desired.

The operation of spinning any form of rayon is very delicate, since the spinnerets are exceedingly fine in bore, and easily choked if the smallest particle of solid matter gets into them. This calls for the utmost care as regards the purity of the water, since the precipitation of lime or magnesium salts would be fatal. Very small pumps are used in great number to produce the necessary pressure, instead of an attempt being made to operate from a pipe supplying a large number of jets. The development of the industry in recent years has been phenomenal, the world production in 1928 being 350 million lb.

Artillery, originally all machines for the discharge of missiles in war, but now only those of a heavier type not carried by hand, also by derivation, the troops concerned in handling these weapons, and the scene of their operation. Slings, catapults, and other weapons for the projection of heavy rocks, etc., were known in classical times, but it was the invention of gunpowder in the West c. 1330 that made the development of artillery possible. Primitive cannon were later experimented with, and 4 pieces were used at Crécy (1346). By the 15th cent. artillery was a common feature of warfare, especially for battering walls, and was used on a large scale by the Turks in the siege of Constantinople (1453). Cromwell, Louis XIV, and Marlborough used heavy guns extensively to support the increasingly efficient musket-fire.

The Royal Regiment of Artillery was founded in 1717, horse artillery introduced in 1793, and field artillery divided up into independent batteries soon after.

With the invention of rifling, first applied to muskets and later to guns,

longer-range fighting became usual.

The second half of the 19th cent. saw the successive introduction of quick-firing guns, buffer recoil, time-shrapnel, field howitzers, and other improvements.

Huge demands for, and intensive developments of, artillery arose during the World War. The number of British guns and howitzers available in France rose from 186 in 1911 to 6437 in Nov. 1918. Howitzers outnumbered guns by more than 2 to 1, their longer life proving a great advantage. Greater accuracy of fire was gained by screen tests, by aerial survey and reconnaissance, and by sound, flash-spot, and air-burst ranging. The development of long range guns culminated in the German "Big Bertha" used for the bombardment of Paris, and throwing a projectile 68 m.

**Organisation.** The unit of British field artillery is a battery, usually consisting of 6 guns, and including (a) material, (b) personnel, (c) transport.

A battery is commanded by a major, with a captain second in command; and is divided into sections of 2 guns under a subaltern, and subsections of 1 gun under a sergeant. Three batteries of guns, or 2 batteries of howitzers or horse-artillery, form a brigade, commanded by a lieutenant colonel.

Until the end of the World War the Royal Artillery was divided into (1) Royal Horse and Royal Field Artillery, and (2) Royal Garrison Artillery, the latter including anti-aircraft sections. After the Armistice this clear-cut distinction was modified.

**Artocarpus** (*Bread Fruit*), a food plant cultivated in the tropics. *Artocarpus incise* is the bread fruit; *Artocarpus integrifolia* the jack fruit. Related to the mulberry.

**Artois** [A-R-TWAH], ancient province of N.E. France (capital, Arras), now represented by the department of Pas-de-Calais and a fraction of Picardy. The name preserves the memory of the Atrebatas, who settled in the district at the time of the

Roman conquest. As a border province Artois experienced several changes of overlordship in the Middle Ages. At first a fief of the Count of Flanders it passed by marriage to the French Crown in the 14th cent. Later it formed part of the domains of the Valois dukes of Burgundy from whom it passed to the Habsburgs. It was recovered by France in 1659 at the conclusion of the Franco-Spanish War.

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**Bas relief** [BAS RELĒF] in sculpture figures or designs which project but slightly from their background.

**Bazel** [BĀZEL] the oblique face

with another special substance. This material has been greatly improved, though originally it suffered from the great drawback of losing strength when wet. As made it has a high lustre, but this can be removed to any extent as desired.

The operation of spinning any form of rayon is very delicate, since the spinnerets are exceedingly fine in bore and easily choked if the smallest particle of solid matter gets into them. This calls for the utmost care as regards the purity of the water, since the precipitation of lime or magnesium salts would be fatal. Very small pumps are used in great number to produce the necessary pressure, instead of an attempt being made to operate from a pipe supplying a large number of jets. The development of the industry in recent years has been phenomenal, the world production in 1928 being 350 million lb.

Artillery, originally all machines for the discharge of missiles in war, but now only those of a heavier type not carried by hand, also by derivation, the troops concerned in handling these weapons, and the scene of their operation. Slings, catapults, and other weapons for the projection of heavy rocks, etc., were known in classical times, but it was the invention of gunpowder in the West c 1330 that made the development of artillery possible. Primitive cannon were later experimented with, and 4 pieces were used at Crécy (1340). By the 15th cent artillery was a common feature of warfare, especially for battering walls, and was used on a large scale by the Turks in the siege of Constantinople (1453). Cromwell, Louis XIV, and Marlborough used heavy guns extensively to support the increasingly efficient musket-fire.

The Royal Regiment of Artillery was founded in 1717, horse artillery introduced in 1793, and field artillery divided up into independent batteries soon after.

With the invention of rifling, first applied to muskets and later to guns,

longer-range fighting became possible. The second half of the 19th cent saw the successive introduction of quick-firing guns, buffer recoil, the chrapnel, field howitzers, and other improvements.

Huge demands for, and intense developments of, artillery arose during the World War. The number of British guns and howitzers available in France rose from 480 in 1914 to 6437 in Nov 1918. Howitzers outnumbered guns by more than 2 to 1, their longer range proving a great advantage. Greater accuracy of fire was gained by secret tests, by aerial survey and reconnaissance, and by sound, flash-spot, and air-burst ranging. The development of long-range guns culminated in the German "Big Bertha" used for the bombardment of Paris, and throwing a projectile 68 m.

**Organisation.** The unit of British field artillery is a battery, usually consisting of 6 guns, and including (a) material, (b) personnel, (c) transport.

A battery is commanded by a major with a captain second in command, and is divided into sections of 2 guns under a subaltern, and subsections of 1 gun under a sergeant. There are batteries of guns, or 2 batteries of howitzers or horse-artillery, form a brigade, commanded by a lieutenant-colonel.

Until the end of the World War the Royal Artillery was divided into (1) Royal Horse and Royal Field Artillery, and (2) Royal Garrison Artillery, the latter including anti-aircraft sections. After the Armistice this clear-cut function was modified.

**Artocarpus** (*Bread Fruit*), a plant cultivated in the tropics. *A. carpus incise* is the bread fruit, *A. carpus integrifolia* the jack fruit. Related to the mulberry.

**Artois** [A-R-TWAN], ancient province of NE France (capital, Arras), represented by the department Pas-de-Calais and a fraction Picardy. The name preserves memory of the Atrebatas, who settled in the district at the time of

**Roman conquest** As a border province Artois experienced several changes of overlordship in the Middle Ages. At first a fief of the Count of Flanders it passed by marriage to the French Crown in the 13th cent. Later it formed part of the domains of the Valois dukes of Burgundy from whom it passed to the Habsburgs. It was recovered by France in 1639 at the conclusion of the Franco-Spanish War.

**Art Schools**, in the exact sense of the term, are of comparatively recent development. Painting and sculpture in the early stages of civilisation were productive and creative processes like building or pottery making and the artist was apprenticed to his trade like any other craftsman. Well known artists whose work was so popular that they could not cope single-handed with the demand had assistants whose training began with the purely technical rudiments of grinding pigments and preparing surfaces and later consisted of actual work on the paintings or models of their master. Rubens was an outstanding example of such a master. Later certain painters organised institutions purely for the purpose of teaching and private schools of this character still exist to-day. But they exist side by side with the much more important official art schools supported by Government or local council grants and controlled by public bodies.

The Royal Academy Schools opened in London in 1682 and have continued ever since. The Royal College of Art at South Kensington began life in 1837 as a school of Design and became the Department of Science and Art in 1852. Five years later it passed under the control of the Council of Education as the National Art Training School. The Slade School of Drawing, Painting and Sculpture is a part of the University of London, and one of the most important and highly regarded schools in the country. The L.C.C. conducts numerous technical institutes where training in the fine arts is provided. These are at Lambeth Westminster and in Southampton Row

are the most important. In all provincial cities and towns of any importance there are art schools generally conducted by the municipalities. The Parisian art schools—*L'École des Beaux-Arts*, *L'Académie Julien* and *La Grande Chaumière*—are the best known and most widely frequented in the world; students come from America, Australia, and all parts of Europe to undergo or complete their training.

#### Art Terms Glossary of

**Agnus Dei** (Lat.) [AGNŪS DĒI] literally Lamb of God the representation of a lamb with flag and cross.

**Altar screen** the partition between the High Altar and the Lady Chapel.  
**At relief** an ornament or figure in high relief in sculpture or carving. The figures project from the base to the extent of more than half their depth.

**Anaglyph** [ANAGLIF] a work of art which is sculptured, chased, carved or embossed in low relief.

**Anglo-Flemish Point de** [PUNTE D'ANGLAIS] lace made in England during Charles II. Origin by Flemish workers.

**Arabesque** style or ornamentation derived from the Moors or Arabs painted, inlaid or carved in low relief. The pattern is of a fantastic nature and may consist of interlaced foliage or scroll work.

**Argente** [ARGENT] a school of sculpture contemporaneous with the Attic school (q.v.).

**Aureole** *Aureole* OR *DOULA* [AUREOLE] the halo which is depicted as surrounding the head of Christ, the Virgin or the Saints.

**Bambino** (It.) [BAMBINO] literally baby in art usually the representation of the infant Jesus.

**Barbours** [BARBOURS] a style of genre (q.v.) painting practised by J. M. W. Turner and others.

**Bas-relief** [BAS-RELIEF] in sculpture figures or designs which project but slightly from their background.  
**Bas-relief** [BAS-RELIEF] the oblique face

- of a gem, the part of a ring that encloses the stone
- Cabinet pictures small, well-finished pictures, suitable for a small room
- Cameo carved gem, on which the figures are cut in relief contrast *intaglio*
- Cartouche* [KAR-TŌŌSH'] a painted, engraved, or sculptured ornament in the shape of a table or oval enclosing a space for an inscription or name
- Cavo-relievo* *intaglio* (*qv*) sculpture
- Cero-plastic art the art of modelling in wax
- Certosino [CHĀRTŌSE'NŌ] work wood inlaid with ivory
- Chalcography [KAL-KOG'-RAFY] the art of engraving in copper
- Champlevé* [SHAHN-LE-VĀ'] kind of enamel work in which the metal ground is scooped out into hollows, leaving a metal ridge or bar outlining the pattern, the paste is then poured into the hollows and fired, contrast *cloisonné*
- Chef d'œuvre* [SHĀ DE'VR] masterpiece
- Chiaroscuro* [KĪAROSKŌŌRŌ] term used in painting to denote light and shade
- Chryselephantine, made of gold and ivory ancient statue with a basis of wood ornamented with gold and ivory, famous statues were those of Zeus at Olympia (one of the Seven Wonders of the World) and of Athena Parthenos in Athens
- Cinquecento* [CHINGWĀCHE'NTO] Italian 16th-cent art
- Clavate [KLA'VĀT] club-shaped
- Cloisonné* [KLOI-zo'n-Ā], substance overlaid with enamel, the design on which is outlined by fine metallic lines, which are the edges of thin metal bands forming partitions for the forms and colours of the pattern contrast *champlevé*
- Colossus statue larger than life
- Concha a conch or shell used by Tritons as a trumpet
- Cornucopia "the horn of plenty"
- Crackle porcelain or glassware porcelain or glassware that has been intentionally cracked in the kiln to give the decorative effect of a net work of small cracks
- Crucifix the representation of Jesus on the Cross
- Damascened [DA'MASEND], said of metal, usually steel, incrustated or inlaid with gold or silver wire
- Decadence in art, the period between the fall of Rome and the Renaissance (*qv*)
- Dentelle* [DAHN-TEL'] decoration light lace pattern in French pottery
- Die-sinking the engraving of dies for stamping designs in relief on medals or coins
- Diglyph [DĪ'GLIF] an ornament in the form of a double groove
- Diota [DEŌ'TA] a vase having two handles
- Diptych [DIP'TIK], a picture in two panels hinged together
- Dry-point *see* ETCHING
- Eclecticism a system based on selections from other systems, in painting is represented by the Bolognese school of the 16th cent, whose aim was to form a style embracing the finest elements in the work of the great masters of Florence, Venice, etc
- Eikon *see* Icon
- Encaustic painting the decoration of a material by burning the colours in
- Facet the natural or artificial plane surface of a crystal or precious stone
- Fayence [FĀ-AHNS] fine kind of painted pottery, orig made at Faenza
- Filagree, Filigree, Filigrane Gold or silver wire plaited and soldered into delicate openwork designs
- Florientine mosaic pictures and designs executed in inlaid coloured and precious stones
- Foreshortening the representation of an object according to the laws of perspective, involving an apparent shortening of the lines which extend towards the observer
- Fresco the painting of murals on wet plaster with pigments previously mixed in water One of the oldest media in art
- Genre [ZHAHNR] painting the painting

- of simple domestic or rustic scenes  
e.g. the work of Wilkie (1785-1841)
- Gobelins** [GÖB-LANG] name of old French tapestries deriving from the name of the family who started their manufacture (see TAPESTRY)
- Gouache** [GÖÖ-AHS] method of water-colour painting involving the use of a mixture of water-colour and gum
- Grisaille** [GRE-ZI-Y] monochrome painting in grey
- Grotesque** [GRÖ-TSEK] fantastic style of decoration in which bizarre combinations of human and animal forms are used
- Headpiece** the ornamental engraving at the beginning of a chapter of a book
- Icon** Ikon or Eikon [I-KON] image or portrait in the Greek Church an icon usu. portrays the figure of Christ in enamel and metal
- Inlay** the ornamentation of one material by the insertion of another to form a pattern
- Intaglio** [INTAL-YEO] design engraved in a hard surface contrast *cameo*
- Lapidary** an artist who works in gems
- Lay figure** a large doll with movable joints used by artists in the representation of drapery
- Limachel** [LEMASH-EL] a marble containing fossil shells
- Linn** to portray or depict
- Louis Quatorze** [LÖÖIKATORZ] *Louis Quinze* [LÖÖIKANZ] terms descriptive of works of art produced during these reigns
- Lunette** space (or painting filling it) of crescent or semicircular shape
- Mahl-stick** (maulstick) a stick having a pad at one end which is used to steady the artist's hand
- Majolica** [MAY-OL-I-CA] type of decorative enamelled Italian pottery
- Majuscule** large or capital letter
- Meander** an ornamental pattern in winding style name derived from the tortuous R. Meander in Caria, Asia Minor
- Medallion** disc of metal usu. circular bearing a picture or inscription
- Mezzo-relievo** figures in relief which project half way from their ground
- Miniature** a small picture or portrait usually painted on ivory
- Minuscule** a small cursive letter the opposite of majuscule (q.v.)
- Monochrome** painting in one colour only or in the various tints of one colour
- Monogram** a design composed of two or more intertwined letters
- Monolith** a monument formed out of a single block of stone
- Monument** a column of building erected in memory of a person or event
- Mosaic** the placing of small pieces of coloured stone or glass in juxtaposition to form a pattern or picture
- Nacre** [NA-KR] mother-of-pearl
- Naturalism** in art the closely imitative representation of nature (see PAINTING)
- Nero-antico** an ancient black marble
- Niello** [NE-ELÖ] a black metallic inlay used for ornamenting gold or silver
- Nimbus** a halo or aureola (q.v.) depicted as surrounding the heads of saints
- Obelisk** a tall rectangular monolithic column pointed at the top
- Obverse** the face of a coin or medal bearing the principal symbol (head) as distinct from the other or reverse side (tail)
- Onocentaurs** fabulous monsters half animals half human
- Oviform** Egg-shaped
- Pastel** coloured crayons
- Pendant** an ornament which hangs from a necklace
- Perspective** the representation on a flat surface of objects at different distances so as to convey the impression of depth distance and recession The Florentine painter Paolo Uccello (1397-1475) was the first artist to use perspective successfully
- Pietà** [PY-Ä-TÄH] a representation of the Blessed Virgin Mary with the body of Christ
- Pigments** the colours used in painting

porter of a protective policy for British industries

**Ashmole, Elias** (1617-1692), lawyer, astrologer, and antiquarian, studied astronomy and mathematics at Oxford, founded the Ashmolean Museum at Oxford with antiquities mostly inherited from John Tradescant (1608-62). He was a favourite with Charles II, and held several Court offices

**Ashton, James Williamson**, 1st Baron (1812-1930), English manufacturer, M P for Lancaster 1886-95, amassed a huge fortune in the manufacture of leather cloths and linoleums. He was a benefactor to national charities, and gave a town hall and municipal buildings to Lancaster

**Ashton-under-Lyne**, borough and market town of Lancs, on the Tame, 6 m from Manchester, it has a pop of (1931) 51,573, and manufactures silk fabrics, cotton goods, and hats

**Ash Wednesday**, the first day of Lent in Western Christendom. The day is so called from the custom of penitents coming to the church door in sackcloth for penance, when ashes were sprinkled on their heads. In Roman Catholic churches ashes are still blessed and placed on the foreheads of worshippers on this day

**Ashwell, Lena** (b 1872), English actress, organiser of soldiers' concerts during the World War, and since then manager at the Kingsway Theatre. Her main stage successes were with Irving in 1895 and 1903, in *Leah Kleschna*, as Pia and Gemma in *Dante*

**Asia**, the largest of the continents, situated E of Europe and N E of Africa. The European boundary is conventional and usually fixed by the Ural Mountains, the Ural and Manych Rs and the straits of the Dardanelles and the Bosphorus. The African boundaries are the Isthmus of Suez and the Red Sea. The Arctic Ocean on the N, the Pacific on the E, and the Indian Ocean on the S form the sea boundaries. Bering Strait conceals a land bridge from N E Asia to N W America, which was probably above sea-level in geologically recent times

The greatest lengths (c 6000 m.) on the continent are from East Cape on Bering Strait (180° E) to Cape Baba on the Aegean (26° E), and from Cape Chelyuskin in Siberia (77° N) to Cape Romania at the S extremity of Malaya (1° N). Area estimated at 17,000,000 sq m

**Population and Commerce.** Asia is the home of at least one-half of the world's population, and of this vast aggregate more than two-thirds inhabit the monsoon regions of the E and S E. Except for Japan, and to a lesser extent India, Asia is very little industrialised in the modern sense, and most of its people are organised in simple agricultural communities. The large supplies the most important contributions to world production. Tea, rice and rubber are the chief crops (nearly the whole of the world's total). Others are cane-sugar, jute, cotton, raw silk, soya beans, tobacco, cereal and coffee. Stock raising is relatively unimportant. Tin and silver are the chief metallurgical products, petroleum and manganese ore are important minerals. Coal is mined, but the industry is not highly developed. Large quantities of salt, chiefly for domestic consumption, are produced in India. The consumption of Asia is in no way commensurate with its potentialities, owing to the poverty of the mass of the inhabitants, nevertheless the prosperity of some of the key industries of the W (e.g. English cotton manufactures) depends chiefly on the Asiatic market. The limitations of this market, due to primitive poverty, have in recent years been aggravated by the depreciation in the value of silver (the currency of almost all Oriental States), political disturbances, and the competition of Japan, which has been felt severely. In 1902 c 10 per cent of British imports came from Asia, and some 18 per cent of her exports went there

**States.** The principal States of Asia at the present time are the British Empire in India and its dependencies, the Chinese Republic with Mongol

and Tibet the Japanese Empire the republics of the U.S.S.R. in Siberia and Central Asia the Turkish Republic the kingdoms of Persia Siam Afghanistan Iraq and Arabia and the French dependencies in Indo-China. The U.S.A. controls the Philippine Islands and the Dutch a number of islands including Sumatra and Java in the East Indies. Borneo is partitioned between the Dutch and British. Palestine is a British and Syria a French mandated territory.

**Communications.** The mountains and deserts of Central Asia are a severe handicap to inter-communication. The only trans-continental railway line crosses Siberia from Cheljabinsk in the Urals *via* Irkutsk to Vladivostok Port Arthur and Peking. The Central Asian Railway with its branches reaches from Krasnovodsk on the Caspian to the Afghan frontier while a branch links this system to the Trans-Siberian at Samara *via* Tashkent. The Anatolian railway serves Asia Minor and links up with the system of lines in Syria and Palestine a branch *via* Mosul to Basra on the Persian Gulf is still incomplete but the gap at Mosul is served by motor transport. India has by far the most adequate railway system. Considerable progress has been made in Japan Indo-China and in spite of political difficulties in China. Notwithstanding modern developments internal communication is however considerably dependent on caravan traffic.

**Geology.** The substructure of Asia consists of a series of rigid continental tablelands whose surface is protected by more or less extensive lava flows (Siberia Arabia the Deccan). The great mountain chains which fill Central Asia from Armenia to NE China, have apparently arisen from an old sea bed. The ranges are volcanic and disturbed by violent earthquakes in the Pacific region (*e.g.* Japan) elsewhere although earthquakes are experienced volcanic activity is extinct or declining.

**Coastline.** A feature of the conti-

nent is its large peninsular area (Arabia India Malaysia Indo-China Korea and Kamchatka). The Arctic coast is low lying much indented and fringed by shallow seas frozen over for most of the year. The Pacific coast is also deeply indented and bordered throughout its length by islands usually of considerable size enclosing large seas (Sea of Okhotsk Sea of Japan Yellow Sea and China Sea). On the outer verge of the islands the ocean descends sharply to the profoundest depths. The shores of the Indian Ocean are mainly even although marked by the deep inlets of the Red Sea and the Persian Gulf. Ceylon is the only considerable island and the continental shelf is narrow.

**Islands.** The principal continental islands are the Kurile group Sakhalin the Japanese islands Formosa the Philippines Borneo Sumatra and Ceylon. Minor groups are the Andaman Nicobar Maldivé La Cadive and Kuria Muria Islands.

**Relief.** The relief of Asia is similar to that of Europe in essentials consisting of a wide N. lowland separated by a central mountain mass from a series of S. trending peninsulas. The nodal point of the central highlands is the lofty Iamur plateau NNW of India whence the chief mountain ranges radiate. Trending NE are the Tien Shan Altai Yablonoi and Stanovoi Mountains bordering the N. lowlands. Between them and the Kuen Lun and Khingan Mountains are the lofty desert plateaux of E. Turkistan (Taklamakan) and Mongolia (Desert of Gobi). The Kuen Lun Mountains form the N. limit of the plateau of Tibet the high & inhabited region in the world to the S. of which the Karakoram-Himalaya run ESE and are continued SE by the mountains of Burma Indo-China, and Malaya. W. of the Pamirs the main fold is narrower and marked by the Hindu Kush K. K. Baba and Elburz Mountains which are linked to the Caucasus by the Armenian plateau. The SW. of Asia is occupied by the



elevated plateaux of Hindustan, Iran, Arabia, and Anatolia. The highest summits of these ranges are the loftiest in the world: Everest (29,140 ft), Godwin Austen or K2 (28,250 ft), and Kanchenjunga (28,200 ft).

*Rivers* Some of the world's longest rivers drain the central highlands to N, E, and S. The principal N-flowing rivers are the Ob, Yenisei, and Lena. The Amur, Hwang-ho, and Yangtse-kiang drain to the Pacific. The Mekong, Menam, and Irrawaddy flow along longitudinal valleys to the S E, the Ganges-Brahmaputra and the Indus drain the N plain of Hindustan to S E and S W respectively, and the Euphrates-Tigris comes down from the mountains of Armenia to the Persian Gulf. Of inland rivers, the Oxus and Syr Darya flowing to the Aral Sea are the longest. Almost all the great rivers of the E and S are navigable for a large part of their courses. The Hwang-ho is subject to disastrous floods.

*Lakes and Inland Seas* The largest sheets of inland water in Asia occupy with one exception the depression of S W Asia. They are the so-called Caspian "Sea" (which is in part European), the largest salt-water lake in the world, the Sea of Aral and Lake Balkash, in roughly the same latitude but farther E, the first much less saline than the Caspian and the second a freshwater lake, Lake Baikal, the largest freshwater lake in Asia, lying among the mountains of S Siberia.

*Climate* Asia has a great range of climate which can be paralleled only in the American continent. N Siberia lies within the Arctic Circle, and Central Asia, which includes a large area 1500 m distant from any sea, is subject to extremes of a "continental" type of greater range than in any other part of the world (Verkhoyansk in Siberia has in Jan a temperature of  $-59^{\circ}\text{F}$ , which in July rises to  $60^{\circ}\text{F}$ ). In general N Asia is dominated by an anti-cyclonic system in winter with bright cold weather. The summers are cloudy, with light rainfall and

fairly high temperatures are experienced except in the far North. S W Asia has either a Mediterranean climate (in the Levant) or else is nearly rainless and largely desert (Arabia, Mesopotamia, Persia). Some of the winter rains, characteristic of the Mediterranean climate, are precipitated as far E as N India and the Himalayas. The Malay Peninsula has a tropical climate with heavy and almost continuous rain.

*Monsoons* The most striking features of the Asiatic climate are the seasonal winds known as monsoons. The heating of the enormous mountain mass of Central Asia in summer draws in a continuous current of air blowing from the S W in India and the S E in China and Indo-China, which, cooling on passing over the mountains, deposits an abnormally heavy rainfall in these regions. N W India is hardly affected. The heaviest rainfall is in the Khasi hills of Assam (c. 400 in per annum). In winter the process is reversed, winds blow seawards, and are generally dry. The N E monsoon picks up sufficient moisture in crossing the Bay of Bengal to ensure fairly heavy rainfall in S India, Ceylon, and Malaya. The violent cyclonic storms which afflict these regions occur usually at the period of climatic instability, when the monsoon is weakening.

*Flora* The flora of Asia is sharply differentiated, the region N of the central highlands consists of tundra with stunted trees, grasses, and alpine flora in N Siberia, succeeded by a belt of coniferous forest shading into barren steppe and sandy desert to S and S W, as the rainfall decreases. The mountains and tablelands of Central Asia are very barren, enclosing large areas of desert, with, however, oases in which European fruit-trees (apple, peach, etc.) will flourish around the centres of inland drainage. The S slopes of the Himalayas are clothed in splendid and varied forest, descending from conifers to the temperate Indian forest in the lower valleys. Teak, evergreen oak, decidar, sandalwood, and bamboo are

abundant in Burma, Malaya and Indo-China. The Ganges delta is clothed in dense tropical jungle. Tea and rice are the characteristic cultivated plants of the monsoon regions and tropical and alpine wild flowers flourish at various levels in the Himalaya. The islands and coasts of the S.E. produce tropical plants, drugs and spices, rubber etc. The Levant has a Mediterranean climate, the typical growth of the S.W. coasts is the date palm, but other fruit trees—apricots, apples etc.—can also be cultivated in these regions.

**Fauna.** The fauna of Asia is divided into clearly differentiated types by the central highlands. Although the tiger and leopard are found as far N. as Siberia, the N. region has a typically palearctic fauna including the wolf, freshwater seal, fur-bearing animals (bear, ermine, Arctic fox etc.), reindeer and lemming. The steppe region is grazed by herds of antelopes, goats, wild asses and horses. S. and S.E. of the Himalayas, the fierce predatory mammals of the tropics (tigers, leopards, rhinoceroses etc.) have their habitat; some of the African fauna reach into Asia, e.g. the lion and the reptiles (python, crocodile). India is the home of many species of venomous snakes.

The native beasts of burden are the elephant in India, Burma and Malaya, the yak in Central Asia, and the camel in the deserts of Rajputana and W. and S.W. Asia.

**Minerals.** The mineral resources of Asia are vast but owing to the backward state of communications are not fully exploited. The Urals, Altai Mountains and the mountains about the Amur and Lake Baikal are rich in precious metals. Inferior coal is worked in N.E. India. The coal reserves of China are known to be enormous, being frequently found near beds of iron ore. Coal and iron also occur in N. Japan. Copper is important in Japan and the tin ores of Malaya and the Dutch E. Indies are the most valuable in the world.

Petroleum occurs in various parts of the continent in Transcaucasia, about the Persian Gulf, in Iraq, Burma, Dutch E. Indies and Borneo.

**Races.** The precise origin of the ethnic divisions is still under debate. Apart from modern infiltrations (e.g. the British in India and the Russians in Siberia) and the survivors of aboriginal races (Dravidians, Oceanic negroes, negritos etc.), Asia is divided between Mongolian and Alpine and Mediterranean peoples. The former race are by far the more numerous and since the dawn of history have been master of the N. plains and plateaux. They include the Turanian, Chinese, the Tatars, Tibetans, Ladakhs and Japanese. The two great families of Mediterraneans and Alpines are the master stock of S.W. Asia and Hindustan, the Mediterraneans (Semites) are strongest W. of the Tigris-Euphrates valley, the seat of the Alpine peoples is the plateau of Iran and the peninsula of Hindustan. The Malays, the indigenous inhabitants of S.E. Asia, are the product of intermarriage between Mongolians and older races. Oceanic negroes are found in some parts of the Philippines and other E. islands. The Dravidians, a short, dark-skinned race, are the primordial people of S. India.

**Language.** The principal languages of Asia belong to three great families: Aryan, Semitic and Mongolian [see LANGUAGES OF THE WORLD] which have degenerated into innumerable dialects in the colloquial speech of Asia. India (q.v.) is a striking instance of this diversity of tongues. Persian is the classical language of the Asiatic Alpines and Chinese of the Mongolians.

**Religion.** The importance of Asia in the history of religion can hardly be overstated. The great monotheistic religions of the world are of Asiatic origin: Judaism, Christianity and Mohammedanism, which have won world-wide influence, had their birth in Palestine and Arabia. A third great religion, Buddhism, of non-

Mongol origin, has been accepted by a large part of the Mongolian race, while leaving little impression on the races amongst whom it arose; caste and sacerdotalism have had deterrent effects on religious progress among the Aryans. The Chinese whose bent is in the direction of philosophic ethics rather than of religious convictions, have adopted Buddhism to a large extent, but they have debased it to the practice of a meaningless ritual. The Chinese philosophers Confucius and Lao-Tse have both elaborated codes of conduct which are highly revered in China, but their conceptions, although mystical, can scarcely be termed religious in the strict sense.

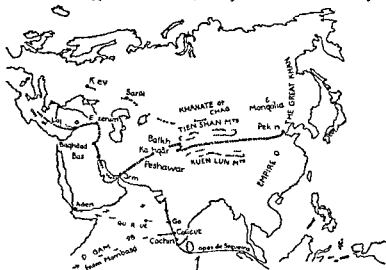
*Civilisation* A considerable part of Asia is inhabited by nomadic peoples, and although recent explorations have discovered the ruins of extinct civilisations on the central plateaux, the significant cultures of Asia have arisen in the great river valleys: the Euphrates-Tigris, the Indo-Gangetic area, and the Hwang-ho. The earliest civilisations were those of the Assyrians of Mesopotamia and the Chinese of the Hwang-ho. The Chinese, cut off from contact with other cultures by mountains and ocean, reached a very high level from their own resources, especially in art, ethics, metaphysics, and architecture, but their civilisation lost vigour and stagnated during the course of centuries until it was stimulated by contact with the European races. The civilisations of the S.W. and India have been more exposed to external influence. The Macedonians carried Greek culture to the shore of the Indus, and the Persian, Saracen, and Indian cultures, responding to this stimulus in various ways, have added to their own contributions, particularly in architecture and literature, as well as making considerable advance in mathematical and medical science. But in material civilisation and political progress Asia has been backward as compared with Europe.

*History* The political history of

Asia is monotonous in its main outline, however dramatic in detail. It is a story of the recurrent rise and fall of dynastic empires, and the only permanent institution appears to have been despotic rule. The empires built up by warrior kings soon decayed before the disruptive ambitions of their viceroy, while the demoralising institutions of patriarchal despotism sap the virility of the dynastic ruler. The Assyrian and Babylonian empires were in decline by 700 B.C. In 550 B.C. the Persian Cyrus took Babylon. The Persian empire was in turn conquered by the Macedonians (4th cent. B.C.), and after a renaissance of power on the decline of Greek influence the Persians fell before the Saracens. Mohammedans in the 7th cent. A.D. In the 11th, 12th, and 13th cents the nomadic Mongolians began their great era of empire-building in the West, and in India and China (q.v.), successive waves of Turks and Tatars destroyed the Saracen power in Asia and threatened the stability of Christendom until the 17th cent. Indeed, the history of S. and S.W. Asia and E. Europe in the Middle Ages is practically a record of the efforts of settled civilisation to withstand the destructive onset of the Mongolian nomads. The Mongol power was, however, in decay before the expansion of Europe opened a new chapter in the history of Asia. The contact with European institutions, which began to be felt effectively in the 18th cent., has made a vigorous impression on Asiatic institutional life, though how far Asiatic character may have been changed thereby is a controversial point. Britain and Russia have been the most influential European races. Russia, with her pre-revolution government of religiously sanctioned monarchy, was sufficiently akin to Asiatic ways of political thought to seem scarcely alien, but British methods of government are the antithesis of the Asiatic ones, and the introduction of ideas of self-government with the apparatus of Western civilisation has been of revolutionary

consequence. The modern European concept of nationalism was adopted by Japan in the middle of the 19th cent and the victory of Japanese nationalism over Russian imperialism in 1904-5 was one of the most significant events of the new century. Since then the principle of nationalism has been recognised in Arabia in Turkey in Iraq and in Persia. Nationalist movement is at work in India as well as in Korea and Syria. Republican government has appeared in Turkey.

pinis were the earliest known Europeans to penetrate Central Asia. The most remarkable of their followers was the Venetian Marco Polo (1260-71) who apparently reached Japan. At the close of the 15th cent the Portuguese reached India by the sea route and the Dutch, French and British followed them gradually extended the exploration of the coasts and islands. The chief travellers in the interior during the 17th and 18th cents were Jesuit missionaries who pene-



Asia (Early Explorer)

and China and recently in Manchuria under Japanese tutelage. The East appears at least superficially to be fermenting with the introduction of new and radical ideas.

**Exploration.** The Chinese appear to have been the earliest explorers of the Asiatic interior but little is known of their work. The desire to see the fabled wealth of the Orient and the Crusaders' enthusiasm for converting the heathen stimulated the early explorations of Asia by Europeans. The Franciscans, Rubruquis and Car-

trated both India and China. In the 19th cent the vogue of scientific exploration which found expression alike in Africa in the Polar Seas and even in the Alps produced important results in Asia. Arabia (qv) was explored to a large extent but the great work was the opening up of Central Asia usually by Russian or British political officers in the earlier stages and later by eminent men of science of all nations. Explorations which have culminated in the great journeys of Sven Hedin (1880-6) and Sir Frederick

Younghusband (1886-1904), who led the British expedition to Lhasa. The greatest of modern explorers in Asia is Sir M. Aurel Stein, among others may be mentioned Huntington, who evolved the theory of the periodic desiccation of the central tableland, and Filippi. One of the most dramatic aspects of Central Asian exploration has been the series of epic assaults on the summit of Mount Everest (*qv*) and Kanchenjunga. See also ARABIA.

**Asia Minor** (*Anatolia*, mod. Turk *Anadolu*), the most W region of the Asiatic continent, consisting mainly of a peninsula projecting between the Black Sea and the Mediterranean, separated from Europe by the Dardanelles, Sea of Marmara, and Bosphorus. It is bounded W by the Aegean Sea, NE and E by Georgia and Armenia (USSR) and Persia, SE by Iraq and Syria. Area, 285,000 sq m, pop c 12,150,000.

**Commerce and Production.** Almost the whole of Asia Minor is comprised in the modern republic of Turkey (*qv*), whose rulers have never fully developed the potential wealth of the country. Minerals, believed to exist in considerable quantities, have not been exploited and agriculture is backward. Communications are poor, roads few and ill-kept, railways neglected. See also TURKEY.

**Relief.** The Black Sea and Mediterranean coasts are even and in places low lying, the Aegean coast is deeply indented and fringed by islands. Asia Minor is a high tableland (mean height over 3000 ft) rising to lofty mountain chains along its edges and traversed in some districts by volcanic ranges (e.g. Erzyish Dag, 13,000 ft). The S coastal fold is known as the Taurus range (Bulgar Dag, over 10,000 ft), with an average height over 6000 ft. The mountains fringing the Black Sea, like the Taurus, are built chiefly of limestones. Along the Aegean coast are many mountains famous in Hellenic mythology (e.g. Mount Ida).

**Rivers and Lakes.** None of the

rivers, the chief of which are Yesil Irmak (ancient Iris), E Irmak (Ilalyz), and Sakaria (Sagarius), is of any commercial importance. The upper course of Euphrates is the chief river of the regions. The Taurus Chai (Cydnus) has carved out the Cilician Gates, a famous pass through the Taurus. Historic rivers are the Kürchük Menderes (Caister) and Menderes Ç (Meander), flowing into the Aegean, and the Menderes Su (Scamander) flowing into the Dardanelles. Lake Van, in the SE, is the largest lake.

**Climate and Vegetation.** Mediterranean conditions with winter rains prevail on all the coasts and for so distance inland. The internal plate has a severe climate of the continental type, with slight rainfall, and most of the central uplands are barren steppes except near the rivers. Mediterranean fruits (oranges, lemons, figs, etc.), cotton, tobacco, and sugar-cane grow in the S valleys, orchards in the Black Sea areas, olives in the sheltered Caucasian valleys, and wheat in the valley of Sivas (*qv*). The seaward slopes of the mountain ranges are well forested with conifers, beech, etc. (valonia), and cedar.

**Fauna.** Domestic animals form one of the principal economic resources of Asia Minor, which raises horses, sheep, oxen, camels, and the angora goat for its valuable fleece. The wild animals are a mixture of types from the untamed temperate regions with those of the Asiatic deserts. Among the former may be mentioned wild boar, various kinds of deer, bears, wolves, and chamois. The Asiatic types include the gazelle, wild sheep, hyena, jackal, and leopard.

**History.** The peninsula acts as a bridge from Asia to Europe, and within its limits the powers of East and West have wrestled for supremacy down the ages. On the whole, Asia Minor has tended to the Asiatic type of civilisation. The coastal areas alone have any geographical affinity with Europe, and the central tableland

afforded a royal road to the nomadic Asiatic conqueror. The Hittites who seem to have received a considerable Nordic infiltration (1500 B.C.) possessed the land until they were overthrown by occidental immigrants who founded the Phrygian power. This empire fell in the 8th cent. B.C. before Asiatic invasions. Greek colonies had been planted on the Anatolian coasts probably about the time the Hittite power was overthrown, but Hellenic culture had no great vitality on this side of the Aegean. In the 6th cent. B.C. the Persians became politically supreme (see GREECE HISTORY OF) till 200 years later the reaction to the Asiatic onset carried Alexander across Asia Minor to the heart of the Persian realm. With the decay of the Macedonian empire the peninsula was divided among many Powers which eventually bowed to republican Rome. Rome and later Byzantium in spite of invasions by the Saracens in the 7th cent. A.D. remained supreme over Anatolia until the 11th century. The district seems first to have been called Asia Minor in the 6th cent. A.D. In the 11th cent. began the series of Mongolian inroads which have left Anatolia a Turkish State to-day. The Seljuk Turks routed the Byzantines at Manzikert in 1071 gaining possession of most of the country. They were followed by fiercer Mongolian tribes in the 13th cent. from whom eventually arose the Ottoman empire which safely outlived the furious attack of the almost fabulous Timur the Tatar. It carried all before it till in 1453 Constantinople the bulwark of European civilisation for 800 years fell to the Turk. The Mongolian inroads of 4 cents. had almost completely destroyed the Orientalised Graeco-Roman civilisation of Asia Minor. The Greek inhabitants of Asia Minor finally were repatriated in 1913 in exchange for Turkish inhabitants of Greece.

**Asiento Treaty** The March 16 1713 between Great Britain and Spain

authorised the importation by British subjects of slaves into Spanish America. This was undertaken by the South Sea Company. In 1750 the treaty was cancelled in consideration of a payment by Spain of £100 000.

**Aske, Robert** (d. 1537) an English rebel against Henry VIII's ecclesiastical policy led the Pilgrimage of Grace (1536) which swept through Yorkshire until Aske agreed to submit to the King. He was freed but early in 1537 was arrested on suspicion of further intrigues and hanged.

**Askwith, George Ranken, 1st Baron** (b. 1861) industrial expert, chief industrial commissioner to the Board of Trade (1911), arbitrator and conciliator in innumerable labour disputes and strike threats between 1910 and the World War. Askwith was chairman of the Arbitration Committee under the War Munitions Act, was created a peer in 1919 and has published several works on industrial questions.

**Asmodeus** the Jewish name for an evil demon credited with killing seven successive husbands of a beautiful woman Sara; he has thus come to personify the destroyer of matrimonial happiness. Asmodeus is mentioned in the apocryphal book of Tobit which contains the story of Sara and in the Talmud in connection with Solomon.

**Asoka** [c. 300 B.C.] Emperor of India from c. 264 to c. 238 B.C. the most powerful ruler of his time, his empire extending from the Himalayas to what is now Madras. Inscriptions and religious edicts incised on pillars and rocks describe how Asoka became a Buddhist in 265, turning aside in disgust from the thought of his earlier military conquests and attempted by missionary propaganda to spread Buddhism through his lands.

**Asp** a name given to venomous snakes of various kinds but usually to species akin to the English adder or viper like the horned viper of Egypt which was supposedly used by Cleopatra when she committed suicide.

**Asparagus** [ŪSPA'RŪGŪS], a genus of the monocotyledonous family Liliaceæ having underground stems. Greenhouse climbing plants *Asparagus medeoloides* is known as Smilax, *A. plumosus* is the Asparagus Fern, *A. sprengeri* is useful for baskets, having small rose and orange flowers, *A. scandens deflexus* is a trailer, *A. vesticillatus*, a climber with feathery foliage. All have scarlet berries. Many species are cultivated indoors. The shoots of *A. officinalis* form the well-known table delicacy.

**Aspasia**, a famous Greek courtesan, born at Miletus, she went to Athens, where she became the mistress of Pericles. She is mentioned by Plutarch, Aristophanes, Xenophon, and Plato, and was reputed to have caused the Peloponnesian War. She is said to have been renowned for her wit and learning.

**Aspen** (*Populus tremula*), a poplar whose leaves move with the slightest breeze, also called the Trembling Poplar.

**Aspern, Battle of** (Napoleonic Wars) (May 21-22, 1809). Napoleon defeated the Austrians under Archduke Charles, each side lost about 20,000 men and each claimed the victory.

**Asperula** (*Woodruff*), hardy annual plants. *Asperula odorata* is the old-fashioned sweet-scented white woodruff, grows well under trees, *A. aurea setosa* is a blue-flowered form.

**Asphalt**, natural solid or semi-solid bitumen (*qv*), chocolate brown to black in colour. The chief deposits are in Trinidad and Venezuela. The famous Trinidad pitch "lake" covers c 100 acres, and is at least 20 ft deep. It is solid at the edge, but viscous towards the centre, with an irregular surface, and is full of gas cavities. The bituminous content is c 40 per cent. The deposit has been used commercially for a long time. The Venezuelan pitch "lake" is even larger, covering 1000 acres. Other deposits occur in Cuba, the Philippine Islands and round the Dead Sea, whence in early days bitumen was

imported into Egypt for embalming. The asphalt used for road paving is now largely prepared artificially but some is imported from Neuchâtel and elsewhere in Europe. Varieties with from 9 to 10 per cent of bitumen are best for road-paving. Asphalt is also used to exclude water and dampness.

**Asphodel** (*Asphodelus*, *Asphodeline*), old-fashioned plants with white or yellow flowers, indispensable in the old world garden.

**Asphyxia**, name given to those conditions in which pure air, i.e. air containing adequate amounts of oxygen, is prevented from reaching the lungs. Such absence of oxygen may come about by the gradual exhaustion of the oxygen in a confined and enclosed chamber, or by the replacement of the oxygen by other gases, from artificial or natural sources. Thus, a man who descends into a well full of carbon dioxide will become asphyxiated quite as readily as one who descends into a tank of nitrogen or climbs into an envelope containing hydrogen. In each case, the absence of oxygen brings about rapid loss of consciousness. A particular type of asphyxia due to smothering, is termed suffocation. This implies mechanical blockage of air passages. Death or unconsciousness due to the inhalation of poisonous gases is not, strictly speaking, included under the term asphyxia, because these poisons may not exert their primary effect on the lungs. Asphyxia only implies absence of oxygen from the lungs, whether this be due to absence of oxygen from the air breathed in, or failure of the lungs to expand.

**Aspics**, cold entrées consisting of small pieces of food, such as prawns, bits of lobster, plovers' eggs, pieces of chicken or liver, set in aspic jelly. The moulds are first lined with jelly, and decorated with truffles, pieces of egg, chevil, tarragon, etc., and the food is then put in, each layer being set in aspic before the next one is added.

*Aspic Jelly*

1 qt water  
 Turn p onion carrot celery shallot  
 small piece of each  
 10 peppercorns  
 4 cloves  
 1 dessertspoonful lemon juice  
 1 sprig parsley  
 1 sprig thyme  
 1 bayleaf  
 Simmer for  $\frac{1}{2}$  hour Strain  
 $\frac{1}{2}$  gill mixed vinegar (malt chills and  
 tarragon)  
 shells and whites of 2 eggs  
 1 $\frac{1}{2}$  oz gelatine to 1 quart (in hot  
 weather oz)

Mix slightly beaten whites of eggs  
 and shells with the vinegar Dissolve  
 gelatine in flavoured stock Add  
 white of egg and vinegar to mixture  
 Whip until there is a head of froth then  
 simmer for 5 minutes and allow to  
 settle for another 5 minutes Strain  
 Add browning if colour is not dark  
 enough Chop on wetted grease proof  
 paper

*Aspidistra*, a well known member of  
 the *Liliaceae* remarkable for its hardi-  
 ness It is a native of the Himalayas  
 China and Japan Unlike the other  
 members of the family and mono-  
 cotyledons generally the parts of the  
 flower are in fours not threes

*Aspidia* (*Creeping Sunflower*) a hand-  
 some late flowering trailing plant  
 with large yellow daisy like flowers  
 recently introduced from the Argen-  
 tine Hardy and only 6 in high  
 suitable for rock gardens

*Aspirate*, the name given in phonetics  
 to the sound represented in English  
 by the letter *h* Normally this  
 occurs only initially or medially  
 between a voiceless consonant  
 and a vowel The term is less  
 correctly applied to the sounds *ph* *th*  
*ch* as in *path* *thin* *lock* It appears  
 from a poem of Catullus that the  
 tendency of uneducated persons to  
 omit the aspirate in pronunciation or  
 to insert it where it is misplaced  
 existed even in classical Rome

*Aspirin* (*acetyl salicylic acid*) is a  
 white water soluble powder with

melting point about 131 C It is  
 manufactured by the action of acetic  
 anhydride on salicylic acid (qv) It  
 has the formula



and is used medicinally to an enormous  
 extent as an antipyretic and analgesic  
 It is also employed against rheu-  
 matism

*Aspromonte, Battle of* (Aug '99  
 1899) the Italian Royalists under  
 General Pallavicini defeated the Garibaldians  
 and re-established Italian rule who  
 was wounded and taken prisoner

*Asquith, Herbert Henry* *see* OTTORD  
 AND ASQUITH EARL OF

*Ass*, an animal belonging to the  
 horse (q.v.) family but smaller and  
 different in many respects notably in  
 having longer ears and also having a  
 tufted tail Represented by one or  
 two Asiatic species and one African  
 from which the domesticated breed  
 was derived

*Assam* *or* ASSAM province of  
 British India situated N.E. of Hindu-  
 tan between Bengal and Burma S. of  
 the Himalayas Bengal separates the  
 province from the coast The interior  
 is hilly (Khasi and Jaintia hills) and  
 the borders are mountainous on the  
 N. and E. There are two extensive  
 lowlands the broad alluvial valley of  
 the Brahmaputra in the N. and the  
 plains of Sylhet and S. Cachar which  
 are watered by the Surma in the S.  
 Severe earthquakes are experienced in  
 Assam The hill States of Khasi and  
 Manipur are feudatory Area c.  
 67 900 sq. m.

*Productio*s The hills are forested  
 and contain iron coal and lime but  
 the staple industry of Assam is  
 agriculture particularly the cultiva-  
 tion of tea Rice cotton jute and  
 oranges are also grown The crude  
 oil industry is of some importance

*Climate* Assam receives the full  
 force of the S.W. monsoon in addition  
 to the rather heavy spring rain The  
 temperature is fairly high (80-84 F.).



The district is both extremely fertile in the lower regions and also very unhealthy.

**Population and Communications** Labour for the tea gardens has had to be very largely imported. Rather more than half of the inhabitants are Hindus, whilst about one-third are Mohammedans. There has been a remarkable increase in the number of converts to Christianity. More than 50 native languages are spoken, besides the dialects of the immigrants. The Assam-Bengal Railway, which connects with the E Bengal State Railway, affords the chief means of communication in the province. Chief town is Shillong. Pop of the province is given as 8,622 300.

**Assandune, Battle of** (= Ashington, Essex) (1016) after a fierce battle the Danes under Cnut inflicted a crushing defeat on a greatly superior English army under Edmund Ironside.

**Assault**, in English law, an attempt or threat to injure another person, provided the assailant seems able to carry out his threat. Mere insulting words are not sufficient. If actual violence is used, the offence becomes assault and battery. It is both a civil wrong, for which the person injured may claim damages, and a crime. It may be justified by the need for self-defence, or the fact that the act consisted of reasonable chastisement of a child by a parent or schoolmaster.

**Assaye**, Hyderabad village near the Berar frontier, where Wellington with 4500 troops, of whom only 2000 were British, defeated (Sept 23, 1803) the combined forces of the Mahratta chief, Scindiah, and the Rajah of Berar.

**Assaying**, a term applied to the chemical analysis of mineral ores and metals. The methods employed will be found described under **CHEMICAL ANALYSIS**, see also **WEIGHTS AND MEASURES**.

**Assegai**, a light wooden spear, tipped with iron, used by the Zulus.

**Assembling**, the final operation of constructing a machine, apparatus, etc., out of prepared parts correctly

made to size, especially in *Manufacture* (*q.v.*) of machines on the interchangeable principle.

**Assembly, Unlawful**, an assembly of three or more persons meeting together for a common purpose, whether lawful or not, in such a manner that a breach of the peace may reasonably be feared from their conduct. As soon as an unlawful assembly starts from its place of meeting to carry out the purpose for which it assembled it becomes a *Riot*, and when it begins to carry out its purpose with a threat of, or actual violence, it becomes a *Riot (q.v.)*. The offence is a misdemeanour punishable by fine or imprisonment.

**Assent, Royal**, the final stage in legislative procedure, which results in a Bill becoming an Act of Parliament. The Royal Assent, worded in Old French, is given in the House of Lords, to which the Commons are summoned, by Lords Commissioners representing the King, or sometimes, especially at the end of a session, by the King in person (*q.v.*) **LEGISLATION**.

**Asser** (*d.c.* 910) Bishop of Sherborne, wrote a biography of Alfred the Great and a history of England from 849 to 887.

**Assessor**, a person appointed to ascertain the amount of taxes, rates, etc., due. It also denotes a person who sits beside a judge to advise and direct his decision, usually in Admiralty cases, e.g. collisions at sea, where the advice of experts on navigation is desirable.

**Assets**, term denoting the property, real or personal, which is available for meeting liabilities or legacies.

**Assignats**, paper money authorised by the French National Assembly in Dec 1790. They became almost valueless on account of forgeries, and in 1796, when they were withdrawn, a gold louis of 20 francs was worth 5300 francs in assignats.

**Assignment**, in law, the transfer of property or the right to property. A transfer is only an assignment if the whole of the assignor's interest in the property is transferred. Thus, a lease

is not an assignment since it reserves the reversionary interest for the landlord on the other hand the tenant may assign his lease to another  
*See also* CHOSE IN ACTION

**Assisi**, Italian city 15 m S of Perugia pop c 18 500 built upon a hill nearly 1400 ft high It is celebrated for its association with St Francis and the pilgrimage Church of S Maria degli Angeli contains the cell in which the famous Franciscan founder died and the oratory of the original monastery There is also a mediæval castle

**Assisi, St. Francis of**, *see* FRANCIS Sr

**Assize** criminal court of first instance having no appellate jurisdiction which is held regularly in every county and authorised to try the prisoners presented for trial In London the functions of the Assize are discharged by the Central Criminal Court  
*See also* COURT

**Assize**, The Bloody the special commission held in the W of England by Judge Jeffreys in 1685 when over 300 persons were executed and thousands were whipped imprisoned and deported for having taken part in Monmouth's Rebellion

**Assize of Bread**, an ordinance of Henry III in 1268 regulating the price of bread in accordance with the fluctuations in the price of corn

**Assize of Clarendon**, an ordinance of Henry II in 1166 abolishing trial by ordeal and providing for trial of criminal cases in Shire Courts the origin of the British jury system It was confirmed and strengthened in 1176 by the Assize of Northampton a code of laws drawn up as instructions to the justices on circuit It extended the scope of the king's jurisdiction and increased the severity of punishment for crimes

**Association** (chem) is the term applied to the phenomena that occur when the atoms of an element or the molecules of a compound conglomerate with the result that the substance may undergo a change in some of its

physical properties Association is most clearly demonstrable in gases where the change in molecular dimensions can be followed by vapour density measurements Thus in the case of sulphur vapour the measurements of vapour density show that molecules exist corresponding at various temperatures to  $S_8$ ,  $S_6$  and at still higher temperatures to monoatomic S Similar phenomena have been noted in the case of many other elements and compounds such for example as arsenic and acetic acid

Investigation has shown that in a large number of substances association is the normal state of existence for instance water is certainly not composed of individual molecules of  $H_2O$  but is a mixture of agglomerations of molecules ( $H_nO$ ) where  $n$  may be equal to 1 or 3

**Association** (psych) *see* ANIMAL PSYCHOLOGY

**Association Football**, *see* FOOTBALL

**Assolizies**, in Scots law the acquittal of a prisoner or in a civil action the giving of judgment for the defendant

**Assonance** a species of imperfect or incomplete rhyme consisting of the use as a substitute for rhyme of the same vowel sounds but different consonants Thus *brandy* and *handy* are rhymes but *bra dy* and *sadly* are assonances The use of assonance is common in Spanish poetry and in the early French *chansons de geste*

**Assuan**, *see* ASWAN

**Assumption**, a Christian feast (Aug 15) commemorating the translation of the body of the Virgin Mary to Heaven It is not generally celebrated in Protestant churches

**Assurance**, *see* INSURANCE

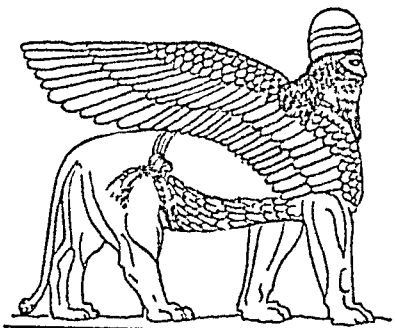
**Assur bani pal**, or *Sardanapalus* king of Assyria in the 7th cent B.C. occupied with campaigns in Egypt Arabia Babylonia and Tyre built up a great empire about 665 B.C. but lost his foreign possessions when the Assyrian kingdom began to weaken under the stress of continual conflict

**Assyria**, ancient W Asiatic empire on the high ground N

the temples were covered by vaults, for one vaulted chamber entire in the thickness of a huge wall has been discovered.

Not only did the Assyrians make use of the arch but there exists ample evidence of their employment of the dome particularly in the vicinity of the large rivers. Even to-day may be seen queer dome-like roofs in the mud-built villages of N Syria and N Mesopotamia.

To this period, then, we largely owe the development of cities, enormous irrigation schemes, an ordered water supply, and fortress building. Stucco and daddoes were in



Winged Bull of Nineveh

use, and carving represented the chase, stately processions, and war. The winged human-headed lion or bull was often introduced to indicate wind, power, and speed. Fragments of these reliefs, from Nineveh and elsewhere, may be seen in the British Museum.

Astarte (*Astoroth*), goddess of fertility, worshipped by the Canaanites and Phœnicians. Female prostitution was a feature of her worship, which was associated with that of Adonis. The name Ashtoreth in the Bible is used to denote heathen goddesses generally.

Aster (*Starwort*) (bot.), a group of garden plants, of which the bedding aster and the Michaelmas daisy (*qv*) are members. Besides these, notable asters are *Aster Farreri*, a 2-ft hardy

perennial with mauve flowers (yellow centres) 3 in in diameter, *Aster sub-cornutus*, a hardy perennial, 1 ft. violet-blue and orange; *Aster alpina*, 6 in high, white, blue, and rose flowers, for the rock-garden.

#### Asteroids, see SOLAR SYSTEM

Asthma, a distressing condition in which the sufferer has sensations of breathlessness and lack of air. The attacks are caused by a spasmodic contraction of all the small air passages in the lungs, so that air cannot be freely expelled from the lungs. There seems little doubt that asthma is a form of *allergy* (*qv*), in which the sufferer is sensitive to certain dust in the air which may emanate either from pollens or from animals such as the horse and the cat.

Recent research suggests that it is possible to cure asthmatics by desensitising them against the particular dust which causes their trouble. This work, however, is still in its infancy, and no general claim to cure can yet be made. Palliative relief, however, can often be obtained by breathing in the fumes of amyl nitrite, which acts by relaxing the small air passages and allowing the free expulsion of air from the lungs. Adrenalin, which has the same effect, can also be used, but it requires hypodermic injection, and is therefore less useful to the general public.

Astor, John Jacob (1763-1848), born in Germany, spent some time in London, and emigrated to New York in 1783, where he started business as a fur trader with wide interests in that industry and in finance. Astor left a considerable fortune, and gave the Astor Library to New York City.

Astor, John Jacob (b. 1886), younger son of 1st Viscount, educated at Eton and Oxford, was aide-de-camp to the Viceroy of India from 1911 to 1914, and M P for Dover from 1922. In 1922, Astor bought out Northcliffe's interest in *The Times*, and has since been chairman and chief proprietor of the company controlling that newspaper.

**Astor Nancy Witcher Viscountess** born in Virginia US 1859 married the 2nd Viscount Astor in 1906 succeeded her husband as one of the M P s



Lady Astor

for Plymouth on his succession to the peerage in 1910. She was the first woman to take her seat in the House of Commons and as M P has been interested in temperance and social work.

**Astor Waldorf, 2nd Viscount** born in New York 1859 educated in England and M P for Plymouth from 1910 to 1919 when he succeeded to his father's peerage. Astor served on Government medical research committees was private secretary to Lloyd George in 1918 and in the Ministry of Food till 1921. In 1910 he became proprietor of *The Observer*.

**Astor William Waldorf, 1st Viscount** (1848-1919) grandson of J J Astor emigrated to England after a political career in America (1890) and was naturalised in 1899. He acquired large newspaper interests buying the *Illustrated Mail Magazine* and the *Illustrated Mail*.

**Gazette** He was created a baron in 1916 and a viscount in 1917.

**Astragalus** (*Milk Vetch*) a group of hardy perennial plants with pea like flowers mostly trailing or procumbent and suited to the rock garden. The colours are yellow blue purple or white. *Astragalus gummifer* is one source of gum tragacanth.

**Astrakhan** [ASS TRAKHAN] (1) Province of USSR situated on the Lower Volga and reaching to the Caspian Sea. It is a desert area with sand-dunes and brackish lagoons. Pamflood is very slight. Irrigation would make cultivation possible as the alluvial soil near the river valleys is naturally very fertile. There are however large areas of barren steppe. Area 117,000 sq m. pop c 517,000. (2) Port and administrative centre of (1) situated on the left bank of the Volga c 50 m from its efflux into the Caspian Sea. Fish and petroleum are the principal productions of the area. caviare textile astrakhan (dyed wool) fruit and salt are other items. The university was founded in 1919. Pop 199,000.

#### Astrolabe *see* OBSERVATORIES

**Astrology** the pseudo science of reading the fate of human beings from the stars to be distinguished from astronomy the scientific study of the heavenly bodies. The pretensions of astrologers are based on arbitrary systems and such success as they may claim can be regarded only as chance or coincidence.

The first attempts to study the stars and to interpret their behaviour were made by the Babylonians and the pseudo-science passed through Greece to India China and Rome. In the Middle Ages astrology was brought to Europe by the Arabs who expressed their own particular method of exposition upon it and by the 15th cent the ministers of the cult had become so powerful that no Court was complete without its astrologer and no monarch would dare to feast fast or fight unless assured that the stars were propitious.

**Systems of Astrology** The astrology

of the Babylonians was almost entirely the prerogative of the priests, to whom it was the means of determining the will of the gods who governed the world. The basis of their system was the personification of the most prominent heavenly bodies, which represented their deities. Thus, the Sun and Moon were the gods Shamash and Sin, and the five known planets Jupiter, Venus, Saturn, Mercury, and Mars were the gods Marduk, Ishtar, Ninh, Nebo, and Nergal respectively. The movements and relative positions of these bodies at any time were given ingenious interpretations, and the outlines of the zodiacal constellations (*q v*) were arranged into fantastic pictures, each with a special significance only to be read by the divine eye of the priest.

The influence of the Greeks upon astrology led to an enormous elaboration of previous systems, and an extension of them to include the known sciences, mainly chemistry and biology. There grew up many schools of thought, each with its own code of interpretation, depending upon numbers, colours, stones, parts of the human body, etc.

From this time onwards astrological forecasting became individual, and the horoscope was read for persons rather than for peoples. The horoscope of *Judicial Astrology* is a map of the heavens, showing the signs of the zodiac. The zodiacal constellations were studied very carefully, and the exact positions of the planets with regard to them at the time of a man's birth or marriage influenced his future.

Such were the prevailing schemes of interpretations in Europe when Francis Bacon denounced its practitioners along with the alchemists. Magical methods had no appeal for thinkers such as he, and when scientific pursuit became popular for its own sake, astrology fell under the ridicule of writers such as Swift. Its former popularity can be gauged by the numerous literary references and by the survival to this day of words like "saturnine," "lunatic," and "ill-starred."

**Astronomy**, the science and study of the heavenly bodies, and of the relation to the Earth.

*Purpose.* A knowledge of the heavenly bodies is essential to navigation both by sea and air, in order to determine time, position, and direction (*see NAUTICAL ASTRONOMY*). The laws which govern celestial movement must, therefore, be studied and applied to predict tides and stellar positions. Moreover, terrestrial problems in geography and surveying can be settled by reference to the sky, and the various Greenwich times (*see OBSERVATORIES*) are accurately standardised by celestial observation and measurement.

*Methods.* The study of astronomy began with continuous observation of the heavens over a long period of years, leading to a careful description of its regular features. The relative positions of stellar bodies were closely marked on star maps, and their periodic movements noted. It was, therefore, at quite an early stage that eclipses, transits, risings, and settings could be predicted, but such prognostications were based purely on the empirical knowledge of recurring cycles. They were not the result of theoretical calculations founded on theories of the forces controlling their periodic movement. Nowadays, observation and measurement are combined with theory to interpret past, present, and future movements. For purpose of measurement, the earth is taken as a frame of reference, and is regarded as a motionless point situated at the centre of a vast hollow ball, the celestial sphere (*q v*). Relative to a fixed earth, the sun, moon, and planets appear to move in definite, regular paths against the background of the sky. The whole sphere, studded with fixed stars, also appears to suffer a diurnal, an annual and a long precessional cycle corresponding to the earth's actual movements—its daily rotation on its axis, its yearly revolution round the sun, and the slow precessional spin of its pole. Theory and mathematics are then applied to interpret these regular

celestial movements to discover the actual or proper motions of those bodies to chart the whole celestial sphere and to examine its structure. For the individual study of heavenly bodies and the examination of particular phenomena like eclipses ordinary measuring photographic and spectroscopic instruments are supplemented by special apparatus. Distance velocity mass size brightness temperature and composition are the most important factors that are scientifically investigated. Lastly the total knowledge thus gained is combined and sifted with the aid of other sciences to answer the absorbing questions of cosmology (q.v.).

*History of Astronomy* Astronomical observation must have begun in the very cradle of civilisation for by the 3rd millennium B.C. the Babylonians had sufficient empirical data in the form of records to enable them to predict many regular movements. The paths of the sun moon and most prominent planets were known and their times of rising and setting together with planetary conjunctions and oppositions fairly well calculated. Solar and lunar eclipses were predicted and they used a cycle of records called the *Saros* which gave a period of 23 lunations (18 years 11 days) for the time taken for the moon's return to the same position relative to the sun and earth.

True scientific study divorced from Astrology began with Thales among the Greeks in the 7th cent. B.C. He is regarded as the first philosopher and was probably the first to consider the earth as a sphere poised in space. He was followed by many great thinkers whose work crystallised in the Alexandrian school c. 300 B.C. when the first catalogues of star positions were prepared and precessional cycles discovered. Aristotle and Ptolemy in his *Almagest* held that the earth was the centre of the universe and explained the apparent movements of the planets by a complicated system of cycles and epicycles.

The great advances of the Renas-

cence began in Italy about 1540 with Copernicus but he retained the belief in uniform circular motions for the planets in their orbits and thus could not explain the anomalies of observation. Towards the end of the 16th cent. the great observer Tycho Brahe began his measurements providing the numerous data from which Kepler was able to draw valuable deductions. The results for Mars enabled him to enumerate 3 important laws which bear his name. (1) The planetary orbit is not a circle but an ellipse with the sun at a focus and the planetary velocity is not uniform. (2) a line from a planet to the sun covers equal areas in equal times. (3) the squares of the periods of planetary revolutions round the sun

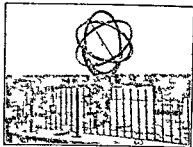


FIG. 1. The Observatory in Peking

are proportional to the cubes of the mean distances from the sun. Meanwhile Galileo was conducting experiments at Pisa leading to the discovery of the Laws of Motion and Gravitation.

The epoch-making discovery of Universal Gravitation by Newton in the 17th cent. marked the dawn of modern astronomy. It was he who linked up the work of Kepler and Galileo and showed that the force which causes the apple to fall to the ground is the same as that which makes the moon move round the earth and the earth round the sun. He demonstrated that Kepler's Laws could be deduced from the single primary law gravitation (q.v.) operating on two bodies moving in space.

counted for some of the irregularities in lunar and planetary orbits by the gravitational effects of other members of the solar system. The calculations of Clairaut, allowing for the disturbances produced in the orbit of Halley's comet by Jupiter and Saturn, led to his successful prediction of the comet's return in 1759, and constituted convincing evidence of the soundness of Newton's principles. An even more spectacular triumph of mathematical astronomy was the prediction, on theoretical grounds alone, by Adams and Leverrier of the presence of another major planet, and the consequent visual discovery of Neptune in 1846 in the spot indicated mathematically. This proved a landmark in astronomical history, and settled the future of mathematical astronomy as a pursuit quite distinct from, though dependent upon, the observational.

Going back a little, the 18th cent had seen an extension of the main scene of observation from the solar system to the stellar, and a concentrated study of the movements of the so-called "fixed" stars. Their long precessional cycle and the effects of the earth's axial nutation and of the aberration of light were carefully noted, and afforded confirmation that the stars had independent "proper" motions, discovered by E. Halley in 1718, and extended by Bradley a few years later. The transits of Venus during the latter half of the century were studied simultaneously from different parts of the earth, in order to calculate the mean distance of the earth from the sun by the method of parallax (*qv*). In 1783 William Herschel verified the important fact of the sun's proper motion through space. Thanks to the labours of the Herschels and their contemporaries, the 19th cent opened with a great legacy of knowledge of sidereal astronomy. Some thousands of nebulae had been discovered and investigated, and the mutual revolution of double stars had been established. In 1801 the *Histoire Celeste* by Lalande gave the approximate positions of some

17,000 stars, and by 1860 this was succeeded by the *Durchmusterung* of Bonn, with 324,000 noted positions. Many observatories co-operated in the work of star-charting and cataloguing, and in 1900 a photographic chart of the entire heavens was completed.

The introduction of the spectroscope was an invaluable addition to research, and opened up a new branch of astrophysics (*qv*), leading to knowledge of the elemental composition of the sun, stars, and nebulae. The sun's Fraunhofer lines were investigated by many observers, finally to be brilliantly explained by Kirchhoff, and the close photographic and spectroscopic examination of solar prominences during eclipses has provided much detailed information of their nature (*see SUN*).

The beginning of the 20th cent. brought fuller knowledge of planetary satellites and the asteroids (*qv*), and the examination of stellar spectra enabled Campbell in 1911 to calculate the radial velocities of many stars from the Doppler effect (*qv*). The statistical study of numerous stars and their grouping in order of magnitude and development is now giving way to the close examination of individual members of each class in order that their physical and chemical nature may be known, leading to theories of stellar evolution (*see COSMOLOGY*), with stellar and cosmic radiation being dealt with in the light of quantum mechanics and Einsteinian relativity. Jeans's theory of the origin of the solar system has replaced the condensation hypothesis of Laplace, which is still applicable in part to the galactic system and the nebulae. Finally, the observations of Hubble and the calculations of Eddington on the dispersion of stars and nebulae bring us to the theory of our contemporaries that the Universe is expanding in space. *See* Sir James Jeans, *The Mysterious Universe*. *The Stars in their Courses*.

**Astrophysics, see COSMOLOGY**

**Asturian, see STONE AGE**

**Asturias, ancient principality of Spain corresponding to the modern**



ASTRIA Thatched Cottage.

province of Oviedo stretching between the N (Biscay) shore of Spain and the Cantabrian Mountains W of the Basque Provinces. The Asturias was the last stronghold of Christian Spain in the early Middle Ages and the nurse of the warrior race which gradually recovered the peninsula from the Saracen. The heir apparent of Spain bore before the Revolution the title of Prince of the Asturias. See also OVIEDO.

**Astyages**, the last king of the Median empire, defeated by Cyrus the Great, King of Persia, about 550 B.C.

**Asunción** [as ON the you] capital of Paraguay; its full name is Nuestra Señora de la Asunción. The city lies nearly 1000 m N of Buenos Aires on the E bank of the Paraguay River. The port has a busy trade in tropical products (sugar and tobacco) and in leather. Cabot landed near the present city on his voyage up the Paraguay 15 0-7 and a town grew up after the Spanish settlement of the district (1537). After the revolution of 1811 Asunción became the capital of the independent Republic of Paraguay. Pop (1931) 91 000.

**Aswān** (or **Assuan**) a town of Upper

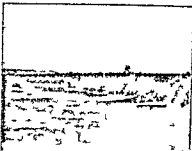
Egypt, capital of Aswān province on the E bank of the Nile, some 500 m from Cairo. It is a popular winter resort for Europeans and an established tourist centre. The great dam across the Nile is 3½ m above the town. Very little of the ancient city exists. Pop. town 16 408, province 267 307. See also IRRIGATION.

**Asylum** Right of, in international law, the right of a State by virtue of its independence to harbour a fugitive from another country.

**Asyūt** (or *Issiut*) capital of the province of the same name on the Nile, Upper Egypt. Pop. (19 7) 67 136. It is the chief centre of the Copts. There is a barrage at Asyut connected with Bahr Luḡ of one of the largest irrigation canals in Egypt. The red and black Asyūt pottery is well known.

**Atbara** (*Bahr al Aswad* or *Black Nile*) right bank tributary of the Nile rising on the Abyssinian Highlands and flowing NW to join the Nile S of Berber. The upper course known as the Tikazze is impeded by cataracts. The silt washed down by the swift flowing stream gives to the Atbara its name Black Nile. Sharp seasonal fluctuations in the volume of the river are a cause of floods in the Nile valley. A barrage has been built near its confluence with the Nile. Length c 90 m.

**Atbara, Battle of** (April 8 1898).





the British and Egyptian army under Sir Herbert (Lord) Kitchener (14,000) routed the Mahdists (18,000) under Mahmud, who was captured

**Atellanæ Fabulæ**, a rough-and-ready kind of comedies popular in ancient Rome, deriving their name from the town Atella in Campania. These comedies were largely improvised by the actors during the acting of them. They are of interest as being the probable origin of such stock characters as found their way later into the harlequinade.

**Athabasca**. (1) District of Canada, originally forming one of the NW territories now partitioned between Alberta and Saskatchewan. (2) A lake partly in Alberta and partly in Saskatchewan, situated W of the Hudson and S E of the Great Slave Lake. It receives the drainage of the Peace and Athabasca R., and overflows by the Slave R. to the Great Slave Lake Area, c 3100 sq m. (3) River rising in the Rocky Mountains in S W Alberta, and flowing N E to Lake Athabasca. Length, over 700 m.

**Athanasian Creed**, one of the creeds of the Christian Church, so called because it embodied the teaching of St. Athanasius. It is not accepted by certain Protestant Churches, mainly on account of its damnable clauses, but it is in use in the Roman and English Churches, as well as among the French Protestants. Its date and authorship are disputed, but evidence points to an origin as early as the 5th cent.

**Athanasius, St (The Great)** (c 298-373), Bishop of Alexandria, famed for long opposition to the doctrines of Arius (q v) and as an almost unrivalled Church leader. He first made his anti-Arian influence felt at the Council of Nicea (325), and, after becoming Bishop of Alexandria in 328, he refused communion to Arius, in defiance of the Emperor Constantine. As a result, Athanasius was banished by the Synod at Tyre, and when he returned 2 years later, he found his see filled by an Arian, so he went to Rome, where a Council of Western Bishops vindicated

him. He was restored to his see (346), but was condemned again by two "packed" synods, and fled to the desert for 6 years, where he wrote anti-Arian tracts and wielded a greater influence than ever. A brief return under Julian, was followed by another flight, but, except for a short exile again in 364, Athanasius was allowed to work undisturbed under the Emperor Valens for the rest of his life.

Athanasius was one of the earliest churchmen to notice the tendency of the State to conflict with religious authority, and he fought against it in defence of ecclesiastical liberty, and was a strong opponent of unorthodox teachings and practice. Arianism persisted 5 years after his death. As a reviver of religious morality and a constant adherent to truth, Athanasius was one of the greatest members of the Early Church.

**Atheism**. Strictly speaking, the word means disbelief in the existence of God, but the actual content of the word has varied greatly. Often used as a term of abuse hurled at those who disbelieve, not in God, but in a particular god, it was applied to the Early Christians by the Greeks, and to philosophers like Spinoza by his co-religionist Jews. To-day it is sometimes applied wrongly to agnosticism (q v), and most correctly to those who deny the existence of God.

**Athelney** [ATH-EL-NI], village c 10 m from Taunton, formerly the centre of a morass, which afforded an asylum to Alfred after his defeat by the Danes in A.D. 878. A jewel of Alfred's was discovered in the neighbourhood in 1693, and is now in the Ashmolean Museum, Oxford.

**Athelstan**, King of the English (924-940), grandson of Alfred the Great. Athelstan brought the kingdoms of Scotland, Wales, Cumbria, and Northumbria under his headship, and overcame opposition at the Battle of Brunanburh (937).

**Athena**, Greek goddess of wisdom, of war, of justice, of peace, of fine arts, and protectress of cities and of

human beings. The large number of associations attached to Athena follow one from the other and begin from the time of her birth—regarding which legends say she leapt fully armed from the head of her father Zeus who had swallowed her mother. As a goddess of war she was associated only with justice and therefore with peace and peaceful occupations such



Ath. 1. mth. A. mpol.

as the arts and crafts of women. The story of her protectorship of Athens tells how in a contest with Poseidon for the position Athena brought out an olive branch as a token more acceptable than a war horse brought by Poseidon. Her symbols include the helmet and shield, the olive branch and the owl.

**Athenæum** [ATH EN EUM] (1) in antiquity the name of any building dedicated to Athena the goddess of

the arts of which the most celebrated was an Athenian temple the resort of the literati of the time. The institution was copied at Rome under the earlier emperors and has in modern times become a common name for literary clubs. ( ) The Ath. nœum Club of London was founded in 184 by Sir Walter Scott and Tom Moore.

**Athenæus**, Greek grammarian of early 3rd cent. A.D. was the author of the *De p. asoph. sta* (Banquet of the Wise) which contains much lore regarding Greek literature and science and many fragments from works which have been lost.

**Athenagoras**, Greek Christian writer of the 2nd or 3rd cent. A.D. wrote an *Apology for the Christians* which was translated into English in 1714. He is also credited with the authorship of an evening hymn still sung daily in the F. Orthodox Church and known in translation in England as 'Hail, gladdening light'.

**Athens**, capital of the Greek Republic situated at the edge of the plain of Attica near the N. shore of the Gulf of Aegæa. The port of Athens is the Piræus c. 4½ m. S.W. of the city. The principal local industries are the manufacture of carpets, coarse textiles, leather goods and stilling tanneries and chemicals. Athens exports wine, tobacco, oil and marble and imports coal and foodstuffs.

It is for her past and the splendid memorials of it which are still preserved that Athens is famous throughout the civilised world. The old town was situated on a series of hills of moderate elevation to the S. of the modern town. The most impressive memorials of ancient art are to be found on the Acropolis on which are the Parthenon (the Temple of Athena, 5th cent. B.C.), the Propylæa, the Erechtheum and the Temple of Nike. Below the Acropolis are the Theatre of Dionysius, the Theseum and the Temples of Asclepius and of Juno (Zeus). A great amount of work was executed in the city by the emperor Hadrian and

philanthropist Herodes Atticus. Of medieval Athens there survive a number of churches of the Byzantine period, some of which are of striking beauty, in particular the Small Metropolis.

The principal buildings in the modern city, which has only arisen during the past hundred years, include the Academy, the University, the National Library, the ex-Royal Palace, and the Parliament House. The National Museum is of supreme importance; there are many other subsidiary museums. Pop 852,000.

*History.* The early history of Athens is obscure. Homer makes scarcely any reference to the city,

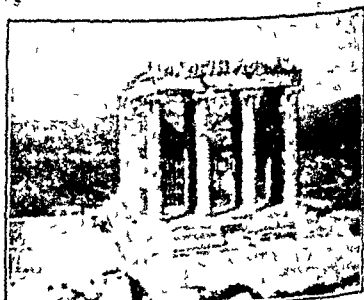
the Pisistratids. Athens took the lead in the struggle of Greece against the Persian power, winning almost single-handed the battle of Marathon (490 B.C.) and sharing in Salamis (480) and Plataea (479). Then followed the great period of Attic civilisation in which the genius of Hellas reached its grandest expression in the drama of Euripides, the art of Phidias, and the statesmanship of Pericles.

Athens was overthrown by Sparta (399 B.C.) as a result of the Peloponnesian War, and later came under the heel of Macedonia (see GREECE, HISTORY). To the period of political decline belong the great philosophers Socrates, Plato, and Aristotle. Athens was the

ARTHUR'S



Parthenon



Temple of Victory (Nike)

which seems to have been in prehistoric times the settlement of a tribe of the ancient Mediterranean race. At the dawn of recorded history, the city was the centre of a small Attic kingdom, and Theseus, the traditional founder of the city, possibly represented the Ionic king, whose political genius was responsible for the absorption ("synoecism") of the subsidiary communities. Athens passed through the usual sequence of kingship, aristocracy, and tyranny, which appears in the history of most of the cities of Greece. The Solonian reforms which marked the early reaction against aristocratic government were the basis of the democratic constitution of Cleisthenes (506 B.C.) after the overthrow of the tyranny of

cultural centre of the Roman empire at the height of its power, but declined with the Empire, and in the Middle Ages was of little importance. It became the capital of a Frankish feudal State in 1204, after the Fourth Crusade (see CRUSADES). At the beginning of the 19th cent., Athens was little more than an assembly of hovels beneath the ruins of her decayed grandeur. After the War of Independence Athens became (1839) the capital of the newly independent Greece.

Atherfield Clay, see CRETACEOUS SYSTEM

Atheroma, see BLOOD-VESSELS, DISEASES OF

Atherstone, William Guybon (1813-

1898) S African geologist a founder of the Geological Society of S Africa (1893) and an originator of the S African diamond industry Atherston drew attention to the possibility of the presence of diamonds near Kimberley and in 1867 identified a crystal found near the Vaal R thus helping to start mining developments.

**Athletic Sports** The practice of athletics is of great antiquity it was especially popular among the ancient Egyptians from whom the Greek



High Jumping, the Fosbury Flop (1).

adopted the elements of that system of physical culture which became so important a feature of their civilization. Greek athletics were intimately connected with religion and the famous "Games" all had their origin in religious observances. The most ancient as well as the most famous were the Olympic Games which said to have been founded in 776 B.C. were held regularly every 4 years until abolished by the Emperor Theodosius in A.D. 393. So great was their importance that time was regularly



Running, the 100 Yards (1).



Throwing the Hammer (1).



Throwing the Javelin (1)



Throwing the Javelin (2)



Throwing the Discus (1)



Throwing the Discus (2)

Many forms of athletic exercise found favour with the populace but from the 13th cent. to the end of the 16th they were frowned on by the Government as tending to discourage the practice of archery. From the 17th cent. onwards this ban was removed and sports of all kinds were encouraged but it was not till the middle of the 19th cent. that the modern system of highly organised athletics really developed. The Royal Military College Sandhurst held organised athletic sports as early as 1812 but their example was not followed by the public schools until about 1840. There were no organised athletics at the Universities before 1850 when a meeting was held at Exeter College Oxford. Other colleges soon followed and the first inter University contest between Oxford and Cambridge took place in 1862.

The *Amateur Athletic Club* was founded in 1880. Championship meetings are now controlled by the *Amateur Athletic Association* founded in 1880 whose championships are held usually at the HQ of the London Athletic Club on the first Saturday in July. The Oxford and Cambridge sports are also held in London shortly before the University boat race.

In the U.S.A. a revival of interest in athletics took place about 1850 and American athletes are now among the best in the world especially in field events. American athletics are controlled by the *Amateur Athletic Union* which in 1890 replaced the *National Association of Amateur Athletes of America* founded in 1870. The American Athletic Union controls other sports such as amateur boxing and billiards as well as athletics proper. In American universities athletics are controlled by the university authorities not as in England by the undergraduates themselves.

A very important event in the history of modern athletics was the revival of the *Olympic Games* for international competition. The first meeting was held at Athens in 1896

since when the games have been held every 4 years (exc pt 1916) each time in a different country. The 2nd Olympiad was held at Paris in 1900 the 3rd at St Louis U.S.A. in 1904 the 4th in London at the White City in 1908 the 5th at Stockholm in 1912 the meeting projected for Berlin in 1916 did not take place owing to the War and the 6th Olympiad was held at Antwerp in 1920 the 7th at Paris in 1924 the 8th at Amsterdam in 1928 and the 9th at Los Angeles U.S.A. in 1932. The principal events at the modern Olympic Games are flat races of 100 200 400 800 1500 5000 and 10 000 metres a 3000 metre steeple chase 110 metre high (3 ft 6 in) hurdles 400 metre low (1 ft 6 in) hurdles 400 and 1600 metre relay race a 50 kilometre walking race and the marathon race 42 km (26 miles) based on the legendary run of the Athenian messenger from Marathon to Athens to bring tidings of the victory over the Persians in 490 B.C. These are known as *track events*.

The *field events* at the Olympic Games are as follows: high and low jump (long) jump hop step and jump up vault putting the weight and shot throwing the hammer discus and javelin. The weight is a 16-lb shot 12 lb hammer the same with a flange at the handle attached the discus is 2 lb 12 oz diameter and weighs 4 lb 12 oz.

In addition to the track and field events there are also canoeing, rowing, lifting, wrestling (free, Greco-Roman), boxing, cycling, gymnastics, rowing, polo, yachting, shooting and the pentathlon and decathlon. The pentathlon is the core of the modern pentathlon and the largest number of participants (100) in the pentathlon races high and low jump hurdles throw shot and the pole vault.

The following are the records for the athletic events.

Event	Time or Distance	Name	Country	Year
100 yds	9½ secs	F Wykoff	USA	1930
1 m	46½ secs	P Williams	Canada	1930
1 m	1 min 50½ secs	B Eastman	USA	1932
1 m	1 min 7½ secs	D G A Lowe	England	1932
2 m	8 min 50½ secs	J Lovelock	New Zealand	1932
3 m	13 min 50½ secs	P Nurmi	Finland	1932
5 m	24 min 6½ secs	P Nurmi	Finland	1932
10 m	50 min 15 secs	P Nurmi	Finland	1932
20 m	1 hr 50 min 4½ secs	G Crossland	England	1932
25 m	2 hr 20 min 29½ secs	H Green	England	1932
100 metres	10½ secs	P Tolan	USA	1932
200 "	20½ secs	P Williams	Canada	1932
300 "	33½ secs	R Metcalf	USA	1931
400 "	46½ secs	C W Paddock	USA	1931
800 "	1 min 49½ secs	W Carr	USA	1932
1000 "	2 min 23½ secs	J Hampson	England	1931
1500 "	3 min 49½ secs	J Ladoumègue	France	1932
2000 "	5 min 21½ secs	J Ladoumègue	France	1932
5000 "	14 min 17½ secs	J Lehtinen	Finland	1932
10,000 "	30 min 6½ secs	P Nurmi	Finland	1931
120 yds High Hurdles	14½ secs	P Beard	USA	1931
220 yds Low Hurdles	23½ secs	C Brookings	USA	1932
110 mrs High Hurdles	11½ secs	E Wennström	Sweden	1932
410 mrs Low Hurdles	52½ secs	G Harding	USA	1931
High Jump	6 ft 8½ in	H M Osborne	USA	1931
Long Jump	26 ft 2½ in	C Nambu	Japan	1932
Pole Vault	14 ft 1½ in	W Miller	USA	1932
Hop, Step, and Jump	51 ft 7½ in	C Nambu	Japan	1932
Hammer	189 ft 6½ in	P Ryun	USA	1932
Discus	108 ft 8½ in	P Jessup	USA	1932
Javelin	212 ft 10 in	M Jarvinen	Finland	1932
Weight	52 ft 9 in	Z Helasz	Poland	1932
Walking				
1 m	6 min 25½ secs	G Goulding	Canada	1930
2 m	13 min 11½ secs	G L Larner	England	1932
4 m	27 min 14½ secs	G E Larner	England	1932
5 m	35 min 17½ secs	A H G Pope	England	1932
10 m	1 hr 15 min 57½ secs	G I Larner	England	1932
20 m	2 hr 19 min 26 secs	J Butler	England	1932
50 m	7 hr 37 min 6½ secs	S C A Schofield	England	1932

Athlone, town of the Irish Free State, on the R Shannon, in co Westmeath, 80 m from Dublin. It was a centre of the Irish war between James II and William III. Pop c 7000. The first earl of Athlone of the present creation (1917) is a brother of Queen Mary.

Atholl, Earls and Dukes of, a Stewart family bearing the title from c 1400 to 1595, and a Murray family bearing it from 1629 onwards. The 4th Earl, JOHN STEWART, was concerned in political intrigues as a supporter of Mary, Queen of Scots, JOHN MURRAY (1631-1703), 2nd Earl and 1st Marquess in the Murray line, supported

William of Orange, but was later implicated in Jacobite risings, and JOHN MURRAY (1660-1724), 2nd Marquess and 1st Duke, opposed the Union of 1707, but later became a Loyalist.

Athor (or Hathor), Egyptian goddess, Queen of Heaven, was worshipped in many forms, but generally symbolised by a cow.

Athos, peninsula in the Aegean Sea near Salonika, famous for the group of monastic communities housing c 6000 monks, half of whom are lay brothers. Mount Athos (over 6000 ft) is a landmark easily seen from the plain of Troy on the E. The monasteries, once the centre of Greek learning,

ing are still rich in rare MSS and books though many were destroyed by fire in 1831 and 1903 and pillaged by the Turks in 181-9. The monastic government and rule resemble those of a mediaeval republic.

**Atkins**, Tommy generic popular name for the British private soldier the name of Thomas Atkins was originally used in War Office forms.

**Atlanta**, capital of the State of Georgia USA situated inland among the Blue Ridge Mountains. Cotton manufactures agricultural engineering and woodwork employ many hands. There is a university for negroes. Pop with suburbs (1930) 3960.

**Atlantic City** town in State of New Jersey USA on the coast c 50 m S of Philadelphia. It is one of the three principal seaside resorts in the State and is visited by large numbers of holiday makers particularly from New York whom it serves as a week-end resort during the hot summer. The scenery of the neighbouring coast is of great beauty. Pop (1930) 6600.

**Atlantic Ocean**, the mass of water lying between Europe and Africa and the Americas separated from the Arctic Ocean by a submarine ridge running from Greenland to the N of Scotland and merging S in the great S Ocean. The conventional N and S limits are the Arctic and Antarctic Circles. It has now taken the place of the Mediterranean as the principal channel of the world's trade owing to its position between two highly developed civilisations. Great length enclosed by land c 8500 m. greatest breadth (along lat 35 S) 300 m. area c 31 500 000 sq m.

**Seas**. The N Atlantic has deeply indented coasts which enclose a number of large subordinate seas. The principal channels communicating with the Arctic Ocean are the Norwegian Sea between Norway and Iceland, Denmark Strait between Greenland and Iceland, Davis Strait between Greenland and Baffin's Land and Hudson Strait the North west Passage

through the N American archipelago. All subsidiary seas are north of the Equator on the E are the Irish North Baltic and Mediterranean Seas on the W Hudson Bay the Gulfs of St Lawrence and Mexico and the Caribbean Sea.

**Drainage**. The Atlantic receives the greatest area of river drainage in the world. The continental rivers on the whole slope gently to the ocean and its seas while presenting an abrupt slope to the Pacific hence a greater proportion of the world's longest rivers find their outlet in the smaller ocean. The largest Atlantic flowing rivers are on the W the St Lawrence Mississippi Missouri Amazon Orinoco and Plate on the E the Congo is the greatest river that directly enters the Atlantic the Niger and the Loire also flow into the main ocean but the Nile and the chief rivers of E. Africa drain in various directions to the subordinate seas.

**Relief**. The most striking feature of the bed of the Atlantic is the submerged ridge almost exactly in mid-ocean between 40 S and 50 N. At its N end it broadens into a submarine platform (the Telegraph Plateau) extending from Newfoundland to W Ireland from which two volcanic ridges extend to the E. and NW forming the true boundary of the Atlantic. Over this central ridge the average soundings are 1700 fathoms decreasing in the N to an average of 250 fathoms above the volcanic ridges. The greatest ocean depths lie on either side of the central ridge S of the Telegraph Plateau and between it and the continental shelves. The soundings in these trenches average c 3000 fathoms. Naves Deep N.E. of the Bahamas reaches 4560 fathoms. The W troughs continued into Davis Strait through a depression of the Telegraph Plateau. There is an E-W ridge at a depth of some 600 fathoms running from Madagascar to the Satchel Isles and forming a junction with the central oceanic ridge. The Atlantic Ocean is believed



by some geologists to be of later origin than the Pacific, and there is a persistent legend of a central continent, Atlantis (*qv*), submerged in geologically recent times. The ocean, however, had practically its present appearance in the Cretaceous period.

**Islands** The Atlantic islands are comparatively few. The largest are on the continental shelves: Newfoundland, the W Indies, the British Isles, Iceland, and the Falkland Islands. The oceanic islands are small and scattered. The Azores are exposed summits of the oceanic ridge. Others are of volcanic origin, most are in small groups off the W African coast (Canaries, Cape Verde Islands, Ascension, etc.).

**Winds** The prevailing winds of the Atlantic are remarkably regular in force and direction, the most important being the Trade Winds blowing from  $30^{\circ}$  N and  $30^{\circ}$  S towards the equatorial region, where there is a belt of almost permanent calm. In  $40^{\circ}$  N and  $40^{\circ}$  S prevailing winds are from the W, intermittent and irregular in their force in the N Atlantic, but steadier and stronger in the S, where there are no intervening masses of land. The various meteorological belts move N and S with the seasons, and high pressure over the continents in the cold months produces (especially in spring and autumn) N E winds in the N hemisphere, which are unknown in the S.

**Currents** The main superficial currents of the Atlantic follow the movement of the prevailing winds. The Trades set up W drifts, and in the equatorial region there is a counter-veiling E. drift. The Gulf Stream originates in a branch of the W drift of the S hemisphere, which is forced into the Gulf of Mexico by the angle of the Brazilian coast, the overflow from the Gulf escapes N along the coast of N America. Off the coast of Newfoundland it is forced E by the cold S-flowing Labrador current, and is finally driven to the other side of the Atlantic by the W winds, where it is


subdivided, one stream flowing S to the N W African coast, and the other N past the British Isles. The Brazil current is formed by a S-flowing branch of the same W drift, from which the Gulf Stream originates. The Benguela current is a cold surface movement set up in the region of W winds (S hemisphere) and driven N at the African coast. Beneath the superficial currents there is a steady movement S of water from the melting ice in the Arctic regions and, at great depths, of cold water along the ocean bed. In the immobile region between the equatorial current and the Gulf Stream is the Sargasso Sea, a seaweed-encumbered area.


**Atlantis**, a legendary island, supposed formerly to have existed in the Atlantic Ocean, referred to by Plato as the home of a prehistoric community of mankind engulfed in the ocean as a result of their evil lives.

**Atmolysis** [AT-MO'-LI-SIS] a term introduced by Thomas Graham to describe the separation of two gases of different densities by diffusion through a porous partition, such for instance as unglazed porcelain. The separation depends upon the fact that rate of the diffusion of a gas is inversely proportional to the square root of its density. See also CHEMISTRY.


**Atmosphere** is the gaseous matter surrounding a planet. The term is, however, almost always confined to the gaseous envelope of the earth. This consists of a mixture of gases in about the following proportions: nitrogen 78 per cent, oxygen 21 per cent, argon 0.9 per cent, and carbon dioxide 0.03 per cent, together with minute amounts of hydrogen, helium, krypton, neon and xenon (*qv*), a small quantity of a condensed form of oxygen called ozone, and water vapour in amount varying from 1 per cent to 5 per cent.

Various impurities are present in the form of dust. The fraction of the air breaks up meteorites to form meteoric dust, and winds carry particles from the surface of the earth. These last may be from volcanoes, or

25 Miles Big Bertha Shell 

20 Miles Recording Balloon 



11 1/2 Miles Soviet Expedition, 1933

10 1/2 Miles Prof Piccard's Balloon 

3 1/2 Miles Aeroplane 

30 000 ft Upper Cloud  29 141 ft Mt Everest

10 000 - 13 000 ft Intermediate Cloud 

6 600 ft Lower Cloud   
3 350 ft & Under High Fog 

1 1/2 Atmosphere

denuded rocks, salt spray from the sea the product of combustion of fuel of materials used in manufacturing chemicals, or even small plant and animal organisms, and the pollen from flowers. Most of the particles are so small as to be invisible, but the larger ones are familiar as "motes." Haze in dry weather is due to this atmospheric dust, which also in the higher layers of the atmosphere breaks up the sunlight to form the blue colour of the sky. These dust motes of the higher atmosphere are also responsible for twilight, for they remain illuminated for a considerable time after the sun has set, for the red tints of sunrise and sunset, and for the general illumination of the atmosphere in the daytime.

The pressure exerted by the atmosphere at the surface of the earth is nearly 15 lb on every sq in of surface, but this pressure decreases with altitude. At ground level it will support a column of mercury 30 in high, at a height of 1000 ft only 29 in. Half the atmosphere lies below a height of  $3\frac{1}{2}$  m, and three-quarters below a height of 7 m. At 50 m up the pressure is negligible. It is this greater density of the atmosphere at lower levels which is responsible for the phenomenon of refraction. As light penetrates the atmosphere, the lower layers bend it downwards, so that it appears to come from a source higher up. The more oblique the rays of light the greater the refraction. Hence the visibility of the sun after it has really set. At the Pole this is actually responsible for nearly a month more of daylight than would otherwise be enjoyed. Irregular density in the air near the ground leads to the phenomenon most frequent in deserts and at sea, called *mirage*, which causes distant objects to appear near at hand.

The height to which the atmosphere extends has been variously computed from observing the twilight, meteors, and auroras (*qqv*), and it is estimated to reach a height of at least 350 and possibly more than 500 m.

As air rises from the surface of the earth it enters regions of less and less pressure, and therefore expands. This expansion uses up heat, and the temperature of the expanded air, unless it contained a fair amount of water vapour, would fall  $1^{\circ}\text{F}$  for every 180 ft of ascent. However, water vapour is usually present, and in addition the sun exerts a heating effect to some extent, so that actually the temperature only falls  $1^{\circ}\text{F}$  in every 300 ft. This decrease is, however, not maintained throughout the whole extent of the atmosphere. In temperate latitudes, after a height of  $c$  6 m there is no further decrease in temperature. This height, the tropopause, is taken as the line of junction of the lower regions of the atmosphere, known as the troposphere, with the higher regions, called the stratosphere. Curiously, the temperature at a height of  $c$  10 m is least over the tropics, for there the decrease in temperature continues to an altitude of 10 m. In the polar regions the temperature is uniform from a height of 3 m.

Our knowledge of the stratosphere is not complete, but aeroplanes have penetrated the lower regions, ascending over 8 m, while, of late, balloons have reached the greatest height yet attained by man. Prof Piccard, in 1932, reached the height of  $10\frac{1}{2}$  m, and a Russian balloon, in 1933, 11.8 m. Piccard found uniform atmospheric conditions at a temperature of  $-33^{\circ}\text{F}$ . Kites and free balloons carrying recording instruments have reached a height of  $c$  20 m, and the stratosphere probably extends up to  $c$  40 m, above which the temperature is assumed to rise to a height of nearly 100 m.

The behaviour of wireless waves suggests that at a height of  $c$  30–40 m, during the daytime, there is a conducting layer in the atmosphere, probably due to ultra-violet radiations from the sun. This layer rises at night to a height of over 60 m, when, however, it is regarded as probably due to ozone. This region is assumed to be respon-

sible for the reflection back of wireless waves

The highest layers of the atmosphere are believed on the evidence of spectrum photographs of the aurora borealis to contain oxygen and the presence of nitrogen and other gases is suspected. The atmosphere allows most of the heat from the sun to pass through on to the surface of the earth though over 30 per cent may be absorbed the amount varying considerably according to the amount of water vapour and impurities present. The heat however is retained on the surface of the earth by the atmosphere which prevents to a large extent its reflection back again.

Changes of temperature greatly affect the amount of water vapour in the air. Cold water and even ice evaporate but at any temperature when the vapour has absorbed enough moisture to exert a certain definite pressure on the liquid evaporation ceases and the vapour is saturated. This saturated vapour will then take up more liquid if heated but will deposit it readily if cooled and this is how the various forms of water deposition from the atmosphere fog mist cloud rain hail snow dew and hoar frost (see *v*) are brought about.

Fog and mist are due to the sudden chilling of moist air when there are a lot of dust particles present. This leads to the deposition on each particle of a small quantity of water but as the particles are light they may float in the air for a time. Clouds are only a form of mist at high altitudes but they are continually shedding water which may evaporate before reaching the ground or may reach it as rain. They are usually due to the rising of a mass of warm air into cooler regions higher up the chilling causing condensation of the contained water vapour.

Rain in addition to falling from clouds may condense on particles and fall from a cloudless sky. Snow is formed by the condensation of water vapour at a temperature below freezing-point air being entangled between

the spicules of each snowflake. Hail may consist of small ice particles or of larger ones composed of alternate layers of ice and snow owing to being forced up several times by ascending warm air currents and collecting condensed water vapour from the various clouds it passes through. Dew and hoar frost are ground deposits on clear nights when the rapid falling of the temperature of the land surface chills the moist air which deposits its moisture on exposed objects as dew or if cold enough hoar frost.

When the particles of moisture in a cloud unite to form drops of rain the electric charge in the cloud increases and if the shower does not fall may become high enough to cause a discharge of electricity to the Earth or to another cloud. This discharge is manifested as a flash of lightning and the sudden expansion of the heated air followed by contraction sets up a succession of air waves along the line of the flash these give rise to the sound that reaches the Earth as thunder. Moving air is called wind (see *v*). Winds are mostly due to the heating of air which expands rises and disperses in the higher regions causing a low pressure area in the region it has left into which air flows from all round. The strength of a wind is in proportion to the difference in pressure between the region the air is flowing from and that into which it is flowing. See also CLOUDS METEOROLOGY THUNDERSTORMS WEATHER.

Atmospheric Electricity see LIGHTNING.

Atom, The. In the article CHEMISTRY an account is given of some of the reasons which led chemists about the middle of the 19th cent. to accept the theory of the English schoolmaster Dalton that all matter is made up of elementary atoms. Towards the end of the 19th cent chemistry and especially organic chemistry had made enormous progress by basing its work upon the assumption that there are 80 separate kinds of elementary atoms which are indestructible and all exactly

alike and invariable in their properties Clerk Maxwell compared them to mass-manufactured articles, and in those days they were imagined as having existed in their present form from the beginning of time (see KINETIC THEORY OF MATTER)

The chemist was able to determine very exactly the atomic weight of elementary substances, but this weight was only relative and not absolute, hydrogen or oxygen being taken as having atomic weight 1 or 16 respectively. The physicist, however, by various means arrived at what is called Avogadro's number, that is to say, the number of atoms contained in a "gramme-atom" of any elementary substance, this being the atomic weight in grammes. This number is to a fair degree of accuracy  $6.1 \times 10^{23}$

The fact that the chemical elements are obviously related to one another, and that this relation is in some way connected with their atomic weight, became evident as chemistry developed, and this very soon led to the idea that the elements themselves might be composed of simpler substances, such as the imaginary "protyl" of Prout. But since the elements were regarded as elements just because they resisted all attempts to break them up or change them, it is obvious that proof of such a hypothesis had to be sought elsewhere. The first herald of the marvellous discoveries of modern times was Sir William Crookes' work on the discharge of electricity through highly rarefied gases. He found that in a primitive form of the modern X-ray tube (q.v.), there proceeded from the negative electrode, the "cathode" of the tube, a powerful stream of something capable of exerting mechanical force, such as turning a kind of windmill, and also capable of causing certain minerals to glow with brilliant and beautiful colours. This stream he called the cathode rays.

Sir J. J. Thomson took up the investigation of the phenomena discovered by Crookes. He showed that

the stream projected from the cathode was deflected both by a magnetic and by an electric field, and that it carried an electric charge with it, for if it was allowed to play into a tiny vessel, this became electrically charged. He assumed that the stream consisted of minute particles, each carrying an electric charge, negative in sign, since they were hurled with great force away from the negative electrode. He was able to determine both the mass and the charge of the single particles. The mass turned out to be only  $\frac{1}{1836}$  of that of a hydrogen atom, while the charge was the same as that carried by a hydrogen atom in electrolysis (q.v.). Thomson at once put forward the view, firstly that what is called an electric current is simply a stream of such atoms of electricity, or electrons as he called them, flowing through the interstices between the atoms of a solid metal, and secondly, that chemical atoms really consist of compounds of these negative electrons with corresponding positively charged particles, the existence of which he could not, however, demonstrate. While Thomson's hypothesis has turned out to be perfectly correct, it is only very recently that any approach has been made to isolating the positive electron.

We should naturally look for it as streaming away from the positive electrode in a gas-discharge tube. We actually find that a stream of particles proceeds from the anode, as it is called, but that these are all of the weight of known chemical atoms, though they carry only a few charges, equal and opposite to that of the electron. They are more fully described in the article ISOTOPES. The stream of particles is known as the "canal" rays.

While the positive electron may exist, it is certainly true that all atoms are probably built up of "protons" combined with electrons. The proton has a positive charge; an atom of hydrogen is a proton combined with an electron of equal and opposite charge.

The picture which best fits all that

we know of atoms is that put forward by Lord Rutherford in 1911 and elaborated by the Danish physicist Bohr. It makes the atom very much like our solar system having at the centre what is called a nucleus around which electrons revolve like planets round the sun. The nucleus is built up of protons and electrons combined in some way of which we are unable to form any picture. Probably in most atoms some of the protons are further combined in fours as in the helium atom since as we shall see the helium atom is a product of the decomposition of other atoms. The nucleus has a positive charge and this is exactly neutralised by electrons sufficient in number revolving like planets around it. The number of these electrons is equal to the atomic number of the element. Thus the nucleus of an element is normally made up of a number of protons equal to its atomic weight and about half the number of electrons since the atomic weight is generally somewhat more than twice the atomic number.

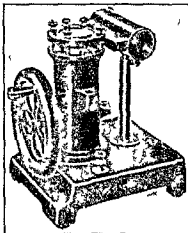
It is picture of the atom as worked



Ray passing through

out to explain two entirely different sets of phenomena firstly radioactivity and secondly the spectra of

elements and compounds. An account of the radioactive elements will be found in the article on the subject



Wilson Apparatus

We will here deal with the nature of radioactivity itself since it is intimately connected with the atom. While the old chemists assumed the atoms of the elements to be immortal it was found that certain atoms burst apart and became completely changed in the process. Also it has since been found possible to cause atoms normally stable to act in the same way. Radioactivity first discovered by Becquerel and shown by Curie who isolated radium to be the property of the chemical atom consists as the name implies in the continual and actual emission of rays by a chemical element. In addition heat and light are also emitted. The rays are of three kinds known by the Greek letters  $\alpha$  (alpha),  $\beta$  (beta) and  $\gamma$  (gamma). The  $\alpha$  rays are found to be identical in nature with canal rays composed of charged helium particles the charge being positive in sign. The  $\beta$  rays are found to be similar in character to cathode rays being streams of negatively charged elec-

trons The  $\gamma$ -rays are exactly similar in nature to the X-rays ( $qv$ ), that is, they are identical in nature with light, but of much shorter wave-length

The above facts are not difficult to demonstrate The  $\alpha$ -rays are, by reason of the weight of the particles, highly energetic, and a single one striking a stream of suitable material can be seen to emit a flash of light Thus for the first time we are actually able to see, if not an individual atom, at least the smash of its impact upon a target, in other words, we can be just as sure that it is there as we are sure that a rifle bullet which strikes

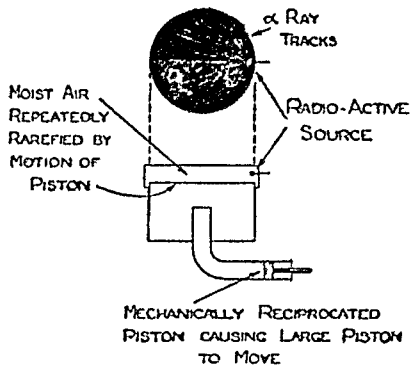


Diagram of Wilson Apparatus

an object, and is lost, really existed The photograph shows another very beautiful demonstration of the individuality of the  $\alpha$ -rays As these hurtle through a gas at an enormous speed, they actually smash the molecules of the gas, and litter their own track with pieces which are no longer electrically neutral but charged Now if the gas consists of vapour, *e.g.* water vapour, cooled so as to be slightly below saturation or "dew point," it will condense to liquid along the track of the particle, since the electric charges or ions render this condensation easy. C T R Wilson constructed an apparatus consisting of a chamber with a glass window, containing water vapour, which could be

cooled by expansion to below the dew point, a minute amount of radioactive substance served as a source of alpha rays, and the result is to show the track of an alpha ray in the form of a white line of minute water globules

The  $\beta$ -rays also are capable of producing tracks in a Wilson apparatus, but both they and the  $\alpha$ -particles also blacken a photographic film, which, however, can be protected from them by a very thin layer of any kind of matter The  $\gamma$ -rays, on the other hand, are more penetrating than the most penetrating X-rays Furthermore, a stream of  $\alpha$ -rays is equivalent to an electric current, just as is a stream of electrons or  $\beta$ -rays, hence both streams are deflected when passing through a magnetic field, though in opposite directions

Lord Rutherford and J C Chadwick showed that the  $\alpha$ -particles, when they strike the atoms of other elements in such a way as to hit the nucleus, may disintegrate the latter and thereby cause the formation of other elements from it The same result may be got by canal rays, that is, artificially produced rays similar to  $\alpha$ -rays, with this, we have at last succeeded in producing a transformation of one chemical element into another, and thus fulfilling the dream of the old alchemist Unfortunately, the nucleus is exceedingly small, and the chance of hitting it is thus so remote that the efficiency of this modern philosopher's stone is microscopically small

It has been one of the greatest triumphs of modern science that this model of the atom, designed to explain the new and entirely unexpected property of radioactivity, together with the almost equally recent discovery of electrons, was able to explain also the facts of spectrum analysis ( $qv$ ), the discovery of which was made by Bunsen and Kirchhoff about 1855 Our purpose here is to describe the mechanism of this emission of light Light was shown by Maxwell to be electromagnetic in character, identical in fact in all but wave-length with the waves

used in broadcasting (*see* ELECTRO-MAGNETIC RADIATION). Such radiation can be produced only by the oscillation of electric charges and the broadcasting station radiates by the motion to and fro of the electricity in its aerial. This aerial being very large it radiates long waves the atom as we have described it with its electrons rotating around the nucleus is thus a minute broadcasting station radiating a wave-length so small that it can only be picked up by other atoms such as those contained in our own eyes and so on. By means of spectrum analysis it is possible to observe and measure with the greatest exactness the wave lengths of the light emitted by any given atom and long before the discovery of the nature and construction of atoms it had been shown that certain mathematical relationships existed between the wave-lengths of all the different rays emitted by a given atom which may run into thousands.

At this point we must refer the reader to the article QUANTUM THEORY. In this it is explained that energy is never transferred from one body to another or emitted or absorbed by matter as radiation except in amounts which are multiples of a certain fundamental constant called Planck's Quantum of Action multiplied by the frequency. Hence when the atom absorbs or radiates light it does so only in multiples of this amount.

The atom retains its electrons moving in orbits of perfectly definite size and number almost unchanged through all sorts of vicissitudes and even after the orbits have been upset by strong magnetic or electric fields or after the external electrons have been torn off by an electric discharge the atom instantly repairs all damage and regains its former perfection. In reality therefore our picture of the atom is incomplete for it does not include the fact that the nucleus seems to be surrounded by a number of perfectly

definite fixed circular grooves in which alone an electron can revolve and furthermore with only one single given velocity (or frequency) the revolving electron is of course equivalent to an electron swinging to and fro into two directions at right angles to each other. Only recently has any explanation been given of this fact but Bohr assumed by a stroke of genius that matters were so and furthermore that the energy of motion of an electron revolving in any given orbit was a definite multiple of the quantum corresponding to the frequency of the electron in that orbit. He then assumed it was indeed necessary that this electron although it was an oscillating charge did not radiate as long as it was moving steadily in its orbit. When it radiated it lost a whole quantum and necessarily therefore jumped into another orbit appropriate to its lesser energy while in absorbing radiation it jumped into a higher orbit. This picture of the atom could now be dealt with mathematically and it was not only possible to explain by its means the various known properties of spectra but also to predict new ones.

One of the most important discoveries lies in the region of the X rays. X rays are produced when cathode rays fall on a solid and it has been found that such a solid emits both a continuous series of X ray wave-lengths and also a few very definite wave-lengths or lines. These correspond to the electrons nearest to the nucleus and these electrons are entirely unaffected by chemical combination or close packing so that while an element only gives its optical spectrum when in the form of a gas it produces its X ray spectrum when solid or when combined in any way whatsoever. The X ray spectrum also depends simply upon the atomic number and it was thus possible to know exactly what the X ray spectrum of a hitherto undiscovered element would look like. While of course every element has an optical spectrum peculiar to itself



looking for an unknown element by means of its optical spectrum is a very difficult matter, whereas it was quite easy in the case of the X-ray spectrum, with the result that we now know of no possible elements remaining undiscovered.

Quite recently an entirely new development in physics has taken place, which will be found described under the term **WAVE MECHANICS**. It is obvious that the picture of an atom which we have given above, while it has led to an enormous number of new discoveries, is yet extremely unsatisfactory. We imagine an electron as a minute negative electric charge, and a proton as a considerably larger mass of positive and negative charges, held together by their attractions, and yet not neutralising one another. We cannot form the faintest conception of the constitution of a proton, nor why, when an electron comes along, it should not be simply swallowed by the proton instead of revolving around it, so forming a hydrogen atom. Chadwick has shown that in all probability a neutron, as it is called, really exists, this is supposed to be a proton which has actually swallowed an electron, thus becoming electrically neutral, while remaining as small as a nucleus. Such a neutron can wander about like a fly in a forest through the interstices of ordinary atoms, and of course, solid matter, yet it possesses the mass of a hydrogen atom. Finally, it has also been shown that positive electrons probably exist, they are produced when atoms of beryllium are disintegrated by X-rays. But unlike the negative electron, which is readily obtained free, indeed streams off in clouds from every incandescent body, it takes cover immediately somewhere or other.

**Atomic Number.** The atomic number of an element may be defined as the number of units of positive electricity that are carried on the nucleus. The atomic numbers run from 1 (hydrogen) to 92 (uranium), and ascend in a series approximately

parallel to the atomic weights, except that in one or two cases the placing of the elements in order of atomic number removes some discrepancies which were apparent when they were arranged in the periodic classification (*q v*) in order of increasing atomic weight.

The atomic number of an element can be deduced from its X-ray spectra, and this work, the initiation of which is due to Moseley, enabled the elements to be arranged in order and showed apparent gaps (since filled in), which were left by elements then undiscovered. *See also* **ATOM**.

**Atomic Weight**, which is a term applicable to elements only, is defined as the weight of individual atoms of the elements when compared with one another. The standard which was first taken used hydrogen, the lightest element, as unity, but this was later abandoned on account of the fact that while nearly all the elements combine with oxygen, many do not form hydrides, and therefore, whilst the ratio of the elements to oxygen can in most cases be determined directly by experiment, this is not the case with hydrogen.

The present internationally accepted standard for atomic weights is that of oxygen, taken as equal to 16 0000; on this standard hydrogen becomes 1 0078 instead of 1 0000. *See also* **CHEMISTRY**.

Interesting work has recently been done on the determination of atomic weight by measuring the mass of individual atoms and noting their behaviour under the influence of electrical and magnetic forces. This has led to the discovery that the weight of atoms of the same element is not always the same, and that in fact the majority of elements consist of a mixture (in constant proportions) of atoms of varying mass. Whilst this discovery has considerably altered our views on the structure of matter, it does not affect the great usefulness of atomic weight determinations, since, with one or two exceptions of little practical importance, the atomic

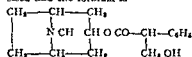
weight is still the chief numerical characteristic that enters into all analytical chemical experiments. The exceptions are chiefly concerned with the radioactive elements (*qv*) where special considerations hold. For further information on this subject see the article ISOTOPES.

The latest atomic weights of all the elements where known are given in tabular form in the article ELEMENTS.

**Atonement**, one of the cardinal doctrines of the Christian religion. It is concerned with the answer to the question why Jesus had to suffer death. The early Christians extended the idea found in the Old Testament of the fall of man and redemption by sacrifice substituting for an individual sacrifice a vicarious one borne by Jesus. Athanasius developed the view that Jesus offered His life as a sacrifice to atone for the sins of all men. In the Middle Ages the doctrine received further refinement at the hands of the scholastic theologians. In their view an atonement for the fall of man was necessary. Only one who was both God and man could have been acceptable to God as an atonement for the sins of men. Thus the doctrine of the Atonement is linked up with that of the deity of Jesus Christ. To-day as much stress is laid on the life of Christ as an act of atonement as on His death. *See also* THEOLOGY.

**Atrium**, *see* ARCHITECTURAL TERMS GLOSSARY OF.

**Atropine** [*p* on AT RO-PEN] an optically inactive alkaloid obtained by the racemisation of the *iso*-rotary *hyoscyamine* found in the deadly night shade (*Atropa belladonna*) henbane and other plants. Atropine is a crystalline substance having a melting point of 115° C. It has been synthesised and the formula is



which it will be seen resembles that of

cocaine (*qv*). Atropine is used medicinally in the form of the sulphate. It has considerable mydriatic (dilation of the pupil) action and is used for this purpose in ophthalmic surgery. It is also widely used for injection prior to operations as it diminishes the flow of saliva and of mucus. Atropine is also used to cure nocturnal incontinence of urine and externally as an anodyne.

**Atsight** commercial term written on bills of exchange or promissory notes to denote that they are payable on demand no days of grace being allowed in such case.

**Attaché** a diplomatic officer attached to an embassy or legation. The term is usually confined to military, naval and commercial attachés whose duty it is to report on military, naval or commercial conditions of the country to which they are appointed.

**Attachment** legal process for bringing a person before the court used particularly in cases of contempt of court. It lifts from arrest in that the writ of attachment may be issued against the person's goods and not only upon his body. It differs from distress in that it does not apply to land. *See also* EXECUTION.

**Attainder** in English law formerly the immediate consequence of a sentence of death. It involved forfeiture of property to the Crown and corruption of blood which meant that the offender could neither inherit nor transmit land. Attainder was abolished for all offences except in case of outlawry by the Forfeiture Act 1870.

**Attainder Bill** of, in England a parliamentary method of dishonouring and punishing persons held to be guilty of offences against the State. It superseded the ordinary legal process and gave rise to much abuse in the 16th and 17th cents many persons being attainted upon little or no evidence the only offence having been their political opinions. The last Bill of Attainder passed in England was in the case of Lord Edward Fitzgerald one of the Irish rebel leaders of 1798.

*See also* IMPEACHMENT.

**Attalus**, three Kings of Pergamum  
**Attalus I** (241-197 B.C.) allied with Rome against Philip of Macedon, he made Pergamum a centre of Hellenistic culture, its school of sculpture being important. **Attalus II** reigned 150-138. **Attalus III** (138-133) bequeathed Pergamum to Rome.

**Attar** (or **Otto**) of **Roses**, see **PER-  
RUMES**

**Attestation**, in a legal document, a clause signed by two witnesses stating that they have duly witnessed the execution of the document. Such attestation is necessary to the validity of most documents, e.g. wills, deeds, etc.

**Attic**, in architecture (1) The masonry rising above the entablature, much used by Roman and Italian Renaissance architects. A famous example is the Attic of St Peter's, Rome. (2) Room or top story of a house, with a ceiling following the angle of the roof.

**Attica**, district of ancient Greece, of which Athens was the metropolis, now united with Boeotia to form a modern Greek department. It is separated from Boeotia by the Cithæron and Parnes ranges. The surface consists of several minor plains intersected by mountain ridges, which trend down to the promontory of Sunium. The principal rivers are the Cephissus and Ilissus. The district produces vines and olives, but is not very fertile. Mount Hymettus is famed for its honey. The climate is remarkable for the clearness of the atmosphere and the moderation of its temperature. Much of the district has been excavated in recent times. Pop. (1928), with Athens and Boeotia, 1,024,667, area (do.), 2410 sq. m.

**Atticism** [*pron* A'tisizm], a term applied to the clear-cut, crystal style developed by the ancient Athenian orators, as distinguished from the florid and overlaid style practised in Asia Minor, and known as **Asianism**.

**Atticus**, **Titus Pomponius** (109-32 B.C.), Roman litterateur, who, on the outbreak of the civil war between

Marius and Sulla, resided in Athens, where he studied for the remainder of his life. **Atticus** was the friend of Cicero and edited a number of letters which Cicero had written to him. No writings of his own are extant.

**Attila**, King of the Huns, 433-53. Under him the Huns overran and settled in Central Europe. By far the greatest of the barbarians at that time, he threatened the Roman Empire, but was defeated by Romans and Visigoths at Châlons, 451. He invaded Italy the next year, but his death in 453 led to the withdrawal of the Huns and a temporary respite for Rome.

**Attis**, a god worshipped in Phrygia, corresponding to the Syrian **Adonis** (*qv*). He was worshipped in connection with the rites of spring, personifying vegetation, and dying each winter and reviving each spring. According to legend he was born of a virgin who conceived after eating an almond. One account says he died by his own hand, another that he was killed by a boar. Cf. **ADONIS**.

**Attorney**, in English law, a person appointed to act on behalf of another. An **attorney-at-law** was a public officer attached to the courts of common law, who conducted legal proceedings on behalf of his clients. The term is now obsolete, all attorneys and solicitors of an English court being now called "solicitors of the supreme court". An **attorney-in-fact** is an agent appointed by a deed, called a *power of attorney*, which specifies the extent of the agent's authority to act.

**Attorney-General**, in England, the principal law officer of the Crown and chief legal adviser to the Government. He conducts all legal business of the Crown, e.g. criminal prosecutions, and is a necessary party in all cases in which the Crown or the Royal Prerogatives are concerned. He is a member of the Ministry, with a seat in the House of Commons, where he defends the legality of the Government's actions. He has also important functions in connection with charities, lunatic's estates, etc. He is leader of the Bar.

but is precluded from private practice while he holds office receiving instead a salary of £7000 and fees for any litigious work he conducts on behalf of the Crown

**Attornment**, in English law the written acknowledgment that a relationship of landlord and tenant exists

**Atwood, George** (1748-1807) English mathematician a brilliant scholar and inventor of *Atwood's Machine* an apparatus for verifying the laws of simple acceleration He was elected a member of the Royal Society (1776) and wrote works on physics and mathematics

**Aube**, department of N.E. France well watered by the Aube and Seine It is an agricultural district with vine yards on the hills of the S.E. There are some manufactures chalk cotton weaving hosiery railway works at Romilly and iron works at Clairvaux A few interesting and early churches with Clairvaux abbey compose the chief monuments Troyes is the capital Area 936 sq m pop (1931) 212 506

**Auber Daniel François Esprit** (1780-1871) French operatic composer held Court positions under Louis Philippe and Napoleon III His first successful setting was *Leicester* done in conjunction with Eugène Scribe Other well known works are *La Muette de Portico* (1828) *Le Domino Noir* (1837) and *Les Diamants de la Couronne* (1841)

**Aubergine** [pron 6 BÄR ZHEV] (*Egg Plant*) belongs to the potato family It is a tropical annual with blue flowers 2-3 ft high bearing egg shaped white yellow or purple fruits The fruits are edible and are usually sliced and fried or stuffed

**Aubusson, Pierre d** (1433-1503) crusader and grand master of the Knights Hospitallers of St John of Jerusalem fought under Sigismund later leading a crusade against the Turks He defended Rhodes successfully (1480) betrayed the Sultan's brother and was made a cardinal (1489)

**Aucassin et Nicolette**, the names of the hero and heroine of a 19th cent French prose romance of the same title It is one of the most charming literary expressions of mediæval sentiment It has been well translated into English by Andrew Lang

**Auckland**, city-seaport and capital of province of Auckland on E coast N Island New Zealand Pop 193- (est) 218 400 Its situation on the Hauraki Gulf is one of extreme beauty The harbour one of the finest in New Zealand is navigable for liners even at low tide Among the imposing public buildings there are two cathedrals an art gallery exchange Government offices and a museum noted for its collection of Maori Art There are educational institutions the Auckland University College opera parks and gardens The chief industries are sugar refining paper manufacture brick making and shipbuilding Auckland which is the largest city in New Zealand was its capital till 1865 when it was displaced by Wellington

**Auckland, George Eden, Earl of** (1784-1849) Governor General of India from 1835 to 1841 During his term of office occurred the Afghan troubles of 1839-41 which ended in the defeat of an English garrison at Kabul

**Auckland, William Eden, 1st Baron** (1715-1814) British statesman Secretary of State 1770 Chief Secretary for Ireland 1780 He negotiated a commercial treaty with France in 1787 and was Ambassador to Spain and Holland In 1801 Pitt appointed him Postmaster General and under Granville's ministry in 1806 he was President of the Board of Trade

**Auckland Islands** group in the Pacific 180 m S of New Zealand area 30 sq m Auckland the largest of the group is 900 sq m in extent and has a good harbour Port Ross The islands are uninhabited

**Auction**, a public sale of real or personal property by the system of competitive bidding Each bid is an offer which may be withdrawn until the time of its acceptance If the

vendor wishes to bid either himself or through an agent, he must expressly reserve the right to do so. The auctioneer must accept the bid of the highest *bona-fide* bidder unless it has been announced that the sale is subject to a reserve or upset price. The practice of "knock-out," i.e. the agreement between several persons that only one of them should bid and that the benefits acquired should after the sale be shared by all, is now illegal. A mock-auction, in which several persons combine to swindle the public by deceiving people into the belief that a *bona-fide* sale is being conducted, is also illegal.

**Auction Bridge**, card game for 4 players, a variety of *bridge* (*qv*), in which every hand is put up for auction, and the right of declaring trumps falls to the highest bidder. Auction supplanted "simple" bridge about 1808, owing mainly to the weakness of the latter in restricting trump-making to the dealer and his partner. At first the dealer was forced to open the bidding, but the forced opening bid was abolished in 1913. The suit values are now *clubs*, 6, *diamonds*, 7, *hearts*, 8, *spades*, 9, and "no-trumps," 10. The dealer opens by bidding the suit he wishes to make trumps, or he may "pass," i.e. make no bid, the player on his left then bids or passes, followed by the other players in turn. Four passes close the bidding. After three opening passes the 4th player may make the opening bid, though it is not as a rule advisable to do so unless a very strong hand is held.

Instead of bidding any player may "double" the previous bid, in which case the opponents may "redouble." Any further bidding cancels a "double" or "redouble." When the bidding is closed, the player on the left of the *declarer* (the successful bidder) leads, and the declarer's partner, as "dummy," lays his cards face-upwards on the table.

The declarer's "book" is 6 tricks, i.e. for a bid of "one," he must make at least 7 tricks, 8 for a bid of "two,"

and so on. If the declarer makes his "contract," i.e. the number of tricks above 6 which he has undertaken to make, he scores the value of the trump suit for every trick above 6, e.g. if he bids "2 hearts," and takes 9 tricks, he will score 21 "below the line," i.e. points counting towards game. If he fails to make his contract, the opponents score 50 "above the line" (not counting towards game) for every trick under the contracted number, e.g. if the declarer bids "3 hearts" and makes 7 tricks, he is 2 tricks "down," and the opposing side scores 100 "above the line." If these hands were doubled, the declarer in the first case would score 48 "below," with a bonus of 50 "above" for making contract; in the second case the opponents would score 200 "above the line." Game consists of 30 points, only "trick points," scored "below the line," counting towards game. A *rubber* consists of the best of 3 games, and scores 250 "above the line." Both sides score "above the line" for *honours*, i.e. court-cards, aces, and tens, 3 ("simple") honours score twice the value of the suit, e.g. 3 honours in *hearts* score 15, 4 honours count 4 times suit value, 5 honours 5 times, 4 in one hand 8 times, 4 in one and 1 in the other, 9 times, 5 all in one hand 10 times. In "no trumps" 3 aces count 30, 4 aces 40, and 4 aces in one hand ("a hundred aces") count 100. Taking all 13 tricks is called making a "grand slam" and scores 100 "above the line," "little slam" (taking all but one trick) scores 50.

A serious rival to auction bridge is contract bridge (*qv*).

**Aucuba japonica**, ornamental evergreen foliaged and berried shrubs for the garden, especially for town gardens and other shady situations. To obtain berries male and female plants must be procured.

**Aude**, department in the S of France with the Mediterranean as its E. frontier. Agriculture flourishes, wheat, oats, rye, and Indian corn being the chief cereals cultivated. The

vineyards in the Limoux and Narbonne districts are of note and olives are plentiful. There is a little iron and manganese and a number of industries connected with brewing brick making sulphur refining textiles and paper manufacture. The climate is warm and dry but subject to violent N E winds. On the W a range of hills unites the Pyrenees with the S branch of the Cevennes and in the N stands the Montagne Noire. The capital is Carcassonne. Area 2450 sq m pop (1931) 296 880.

**Auditor** a person generally an accountant who is appointed to ascertain the exact financial position of a company business or private person. He must examine its accounts and certify that they are correct and properly kept but his certificate is no guarantee that the business has been prudently managed or its funds properly expended.

**Audubon, John James (1780-1831)** American naturalist collected specimens of birds in America and England. His greatest work *The Birds of America* (1826) is an enormous publication of great value the result of 12 years exploration and research.

**Auer** [ow ER] **Leopold (b 1840)** violin professor teacher of Mischa Elman Jascha Heifetz and Efrem Zimbalist among others. He was professor of the violin at the St Ivesberg Conservatory but later lived in New York. He wrote *My Long Life in Music* (1933) and *Violin Master Works and their Interpretation*.

**Auer Metal**, see CERIUM

**Auerstadt, Battle of**, see JENA

**Augsburg** city of Bavaria S W Germany c 40 m NW of Munich on a plateau above the R Lech. It has textile chemical and paper industries and is famous for its architecture and historical associations. Founded as a Roman colony Augsburg became a free city of the Holy Roman Empire in 1276 and was in the later Middle Ages one of the financial centres of Europe. The great banking family of Fugger the financiers of

many European royal and noble houses had their headquarters here. In 1806 Augsburg was absorbed into the kingdom of Bavaria. Pop (1930) 165 500.

**Augsburg Confession of**, a Protestant confession of faith drawn up by Luther Melancthon Jonas and others at the Reformation and presented to Charles V at a Diet of the States of the German Empire in 1530. It consisted of two divisions the first contained 1 articles of faith and the second 7 protests against abuses in the Roman Catholic Church. The confession was too Protestant to please the Catholics and too Catholic to please the Anabaptists and Swiss Reformers but it was accepted by the Lutherans. Melancthon afterwards thought himself at liberty to make certain changes and in 1540 with the idea of reconciling Calvinists and Lutherans he published a new edition in Latin known as the *Confessio variata*. The orthodox Lutherans however would not accept these alterations and the *Confessio variata* became their standard.

The Confession is one of the sources of the Church of England's Thirty nine Articles.

**Augsburg League of** formed 1686 between the Holy Roman Emperor Spain the Netherlands Sweden Bavaria Saxony and Franconia against Louis XIV. The War of the League of Augsburg began in 1688 and ended at the Peace of Ryswick (q.v.) in 1697.

**Augusta**, capital of Maine U.S.A. on the Kennebec R. pop (1930) 17 918. An abundance of water power is provided by a dam. Printing cotton shoes pulp and paper manufacture are the chief industries.

**Augusta, Victoria (1838-1921)** German Empress daughter of Frederick Duke of Augustenberg married (1861) William afterwards William II of Germany and accompanied him into Holland after the World War.

**Augustans**, a term originally applied to the Latin authors of the time of Augustus Caesar regarded as the age of Latin literature. In

literature it is applied to the writers of the reigns of Queen Anne and George I, either because this was once thought to be the greatest period in English literature, or (with more justice) because these writers aimed at a classical correctness and purity of style. However far-fetched is the parallel between these writers and the Latin Augustans, the later application of the term is firmly rooted in the language.

**Augustine, St., of Canterbury**, Christian missionary in the S of England and first Archbishop of Canterbury, was called upon by Pope Gregory I to lead a mission in Britain. He came from Rome, reached Kent in A.D. 597 and was favourably received by Æthelbert (qv), King of Kent, who permitted him to preach and was one of the first to be converted by the new teachings. Augustine was made archbishop, Christ Church, Canterbury, was consecrated in 603, and Augustine began to spread the Christian gospel through the country. He was unable to overcome opposition from the Celtic churches in the W, but made many conversions, and numbers of Christian churches were opened. Augustine died probably between 612 and 614. His feast day is, in England, May 26, elsewhere, May 28.

**Augustine, St., of Hippo (354-430)**, born at Tagaste, in Africa, of a pagan father and a Christian mother, spent his youth as a student at Madaura and Carthage. He was not yet a Christian, and when under the influence of sceptics accepted the Chair of Rhetoric at Milan (384). His *Confessions*, the story of his conversion, are a recognition of his weaknesses and a tribute to the influence of St Paul's Epistles and of Ambrose. He became a Christian by baptism in 387, resigned his chair, and returned to Tagaste. A few years later, while on a visit to Hippo, Augustine was persuaded to accept the bishopric (c. 397) in succession to Valerius, and remained in the see for the rest of his life.

Augustine exerted his influence in and outside Hippo, both by sermons

and lectures and also by numerous writings of great length. His theology brought him into opposition with the Donatists, with Manichæism and with Pelagianism (qv), it has been developed by later interpretations of his works, in an attempt to establish the relation between the human and the divine. His best-known writings are *The City of God* and *Confessions*.

**Augustinian Canons**, members of a monastic order supposed to have been founded by St Augustine of Hippo (A.D. 354-430), though he does not appear to have laid down any rule. Private property was not renounced by its members, and communal life not instituted until the middle of the 11th cent. They were known also as Austin Canons and, in England, as Black Canons, from the black cloaks they wore.

**Augustinian (or Austin) Friars**, an Order of mendicant Friars instituted in A.D. 1205, represented in England at present by houses in Hammersmith, Hoxton, and elsewhere. The London street called Austin Friars commemorates their pre-Reformation house in London.

**Augustulus, Romulus**, last Roman Emperor of the West (475-6). He was deposed by Odoacer, who made himself King of Italy. With his deposition the W. half of Europe ceased to acknowledge an Emperor, and the W. Roman Empire came to an end.

**Augustus** [*pron* AW.GU'strŭs], the title originally conferred by the Roman senate in 27 B.C. upon Gaius Octavianus, the successor of Julius Cæsar. It was afterwards borne by emperors both of the ancient empire and of the Holy Roman Empire.

**Augustus, Gaius Julius Cæsar Octavianus** (63 B.C.-A.D. 14), Roman Emperor, great-nephew and successor to Julius Cæsar. Studied at Apollonia, went to Rome on Cæsar's death (44 B.C.), and formed a triumvirate with Antony and Lepidus. The triumvirs defeated Brutus and Cassius Augustus then deposed Lepidus, and later beat Antony in battle (31 B.C.), thus be-

coming ruler of the whole Roman Empire. The Senate proclaimed him *Augustus the Venerable* (27 B.C.) for his State services. Augustus gained victories in Gaul, Spain and Asia, but was defeated in Germany by Varus in A.D. 9. His rule was accompanied by social and administrative reforms in Rome and was notable for the encouragement of literature.

**Augustus**, name of Electors of Saxony. **AUGUSTUS I** (1596-1586) sought religious peace in an attempted Protestant union and cultivated the friendship of the Habsburg monarchy. **AUGUSTUS II** (1600-1733) became Elector of Saxony, 1694 and King of Poland, 1697. He continued the Turkish War and made an alliance against Sweden, but Poland refused support and he renounced the throne (1706). He fought in the War of Spanish Succession, turned to Poland again and recovered the crown in 1709. **AUGUSTUS III** (1696-1763) elected King of Poland, 1733, was driven from Saxony by Frederick the Great but was restored by the Treaty of Hubertsburg, 1763.

**AUKS**, sea birds closely allied to the puffin and razor bill. The best known is the Great Auk, a flightless species formerly inhabiting the N. Atlantic, which was finally exterminated in 1844. The Little Auk serves as a source of food to the Eskimo who also use the skin for making clothing.

**Aulic Council**, a body instituted by Maximilian I, Holy Roman Emperor soon after the establishment of the Imperial Chamber by the Diet of Worms in 1495 to act as the supreme council of the Empire. The council comprised a President, Vice President, the Vice Chancellor of the Empire and 18 other members and was the supreme executive and judicial body.

**Aulnoy**, Marie Catherine, Comtesse d' (1600-1655) French writer conspired against her husband, Baron d'Aulnoy, was exposed and fled to England and then to Spain. She was allowed to return by Louis XIV. in reward for secret State services. Her writings include fairy tales, accounts

of her life in England and Spain and historical works.

**Aulus Gellius** (A.D. 130?-180) Latin poet, author of *Noctes Atticæ*, a mine of information on grammatical and historical questions, though its own literary value is very small.

**Aungmyethazan**, see BRONZE AGE ETHNOLOGY.

**Aurangzeb** (1618-1707) Mogul emperor of Hindustan, deposed his father, Shah Jahan, had his brothers killed and seized the throne. Wars in the Deccan disturbed his reign, which marked a decline in the empire.

**Aurelian** (Lucius Domitius Aurelianus) (c. 192-5) Roman Emperor from 270. He continued the war against the Goths and defeated the Germanic tribes, was assassinated in 275 on an expedition to Persia.

**Aureole**, (1) The gold halo surrounding the head of a person in sacred pictures in Christian art. (2) In theology, a reward additional to the common bliss of heaven given to virgins, martyrs and teachers.

**Auricle**, term for the upper two chambers of the heart of vertebrate animals. Some forms have only one. The name is supposed to have been derived from a resemblance to the external ear. See also CIRCULATORY SYSTEM.

**Auricula**, Alpine primula from which a group of greenhouse and garden plants have been raised, possessing flowers that have unusually decorative green, grey and blues in the petals, and a white meal or farina over the stems, buds and leaves. Although easily raised from seeds, it is usually necessary to propagate special colours by division of the roots or by offsets.

**Auriga**, see CONSTELLATIONS.

**Aurignacian**, see STONE AGE.

**Aurochs**, a huge wild ox, the ancestor of the aurochs that formerly inhabited Europe and was apparently the ancestor of our domestic breed. It was finally exterminated about 1630. Subsequently the name was wrongly

European bison. See *Aurora borealis* (6).



LIS], sometimes called Northern Lights, produces beautiful luminous effects in the Arctic regions. A similar phenomenon in the Antarctic is called the Aurora Australis, and the comprehensive term Aurora Polaris is sometimes used to include both.

The aurora usually occurs as an arc of light over the magnetic meridian, at a height of between 50 and about 250 m, though in a sun-illuminated atmosphere the light has been traced up to a height of 600 m. It has been alleged to extend below the clouds, and, if so, must be within a few thousand ft of the earth. Rays of light frequently stream from the arc, and extend over the sky, sometimes shrinking back, and re-extending with a kind of pulsating motion, and for this reason have been regarded as electrical discharges. This view can be confirmed by passing an electric current through a vacuum tube which has been nearly exhausted of air, a glow resembling the aurora being obtained. In Finland, a true aurora has been produced by sending an electric current through a network of wires.

Spectrum photographs of auroras show a typical green line due to oxygen, and this can be photographed when no aurora is visible to the eye. Hence it is possible that auroras are permanent. It has been suggested that they are electrical manifestations equivalent to thunderstorms, which are rare in polar regions, and they appear to bear a definite relation to sunspots and magnetic storms. They are therefore usually regarded as electrical discharges induced by, and perhaps even coming from, the sun.

**Aunsonius, Decimus Magnus** (c. 310-390?), Latin poet, native of Bordeaux, was tutor of the Emperor Gratian. His works include epistles, translations, and epigrams.

**Austen, Jane** (1775-1817), English novelist, lived an uneventful life in Hampshire and Brith. In this circumscribed area she used her powers of keen observation and delicate humour to good effect. Her novels were *Pride*

and *Prejudice* (written 1797, published 1813), *Sense and Sensibility* (written 1798, published 1811), *Mansfield Park* (1814), *Emma* (1816), *Persuasion* and *Northanger Abbey* (posthumously published in 1818). In her own ironical style, Jane Austen reigns supreme. Records of minor flirtations and troubles in middle-class life in the provinces become great literature through her delicate analysis of character and her beautiful prose. See NOVEL, THE ENGLISH.

**Austenite**, see IRON AND STEEL.

**Austerlitz, Battle of** (Dec 2, 1805), the French under Napoleon I (75,000) gained a signal victory over the Russians (50,000) and Austrians (25,000) under Kutusov, who lost 20,000 men and many guns against a French loss of 5000. Also called the Battle of the Three Emperors.

**Austin**, capital of Texas, USA, situated on the Colorado river. Pop. 53,120. The chief object of interest is the great dam, 1200 ft long, across the Colorado R., one of the largest in the world. Austin is the seat of the State University of Texas. Live stock, cotton, cereals, wool, and flour are its main products.

**Austin, Alfred** (1835-1913), English poet. His work, which includes *Soliloquies* (1882), *England's Darling* (1896), and *The Conversion of Winckelmann* (1897), is marked by a love of Nature that is sincerely, though not always poetically, expressed. He was made Poet Laureate in 1896, following the death of Tennyson (1892).

**Austin, H. W.** (b. 1900), English tennis player. In 1922 he won the Junior Championship, in 1932 he reached the singles final at Wimbledon, and in 1933 was one of the Davis Cup Team, which recovered the trophy for England, after 21 years.

**Austin, John** (1790-1859), English jurist, first Professor of Jurisprudence at University College, London, 1828-32. He wrote on the theory and philosophy of law. His works are brilliant and stimulating, and form a necessary preliminary to the study of

law as a science though his conclusions are not always acceptable. His publications include *The Province of Jurisprudence*, *A Plea for the Constitution*, *Lectures on Jurisprudence*.

**Austral, Florence** (b 1894) dramatic soprano was born in Melbourne Australia married 1925 John Armao. First appeared at Covent Garden with the British National Opera Company in 1922. She has made many tours of the United States where she is very popular and has sung at the *Staatsoper* in Berlin.

**Australia**, the largest island in the world forming the principal continental land mass in Oceania (qv). It is situated between lat 10 and 43 40 S and long 113 0 and 153 40 E. It is bounded on the N by the Timor and Arafura Seas on the E by the Pacific Ocean and on the W by the Indian Ocean. Greatest length W-E c 2400 m greatest breadth N-S c 2000 m. Area nearly 3 000 000 sq m.

**Geology** Australia is built up for the most part of pre Cambrian sedimentary rocks deposited as a plateau over a stable Archaean platform. The E of the continent is covered by more recent rocks and the long spine of the Dividing Range is diverse in character the higher summits of the S are of volcanic origin elsewhere the mountains are superficially built of lime stones conglomerates quartzites and slates.

Nearly 1 million sq m of the area is underlain by natural reservoirs or artesian wells a most important source of water supply in such a desiccated region.

**Coastline** Australia is very little indented except on the NW where the coast is much broken between Hyland Bay and King Sound. The deep rectangular Gulf of Carpentaria is the most striking feature of the N coast. In the SE the estuaries of Spencer and St Vincent Gulfs interrupt the long smooth coast of the Australian Bight which extends for over 1000 m without the slightest

break. Port Philip Bay farther E is another considerable inlet in Victoria. The E coast is more rugged but there are no deep indentations. The continental shelf is fairly broad and in the N extends to New Guinea. Tasmania to SF separated by Bass Strait from the mainland is the only large island.

A coral reef the Great Barrier Reef (qv) extends for 1900 m along the NE coast c 150 m from the mainland in the S but approaching to within 20 m in the N. The coast is c 12 00 m long.

**Relief** Australia falls into two main topographical regions which might be divided by a line drawn from the SW corner of the Gulf of Carpentaria to the SE angle of the Australian Bight. To the W of the line is an immense tableland having a mean elevation of c 800 ft. Arnhem Land NW of the Gulf of Carpentaria and the Macdonnell and Musgrave Ranges in N Territory reach some 3000 ft. The E section consists of the Great Dividing Range and a lowland area E of it stretching from New S Wales to the Gulf of Carpentaria. The Great Dividing Range is narrow in the N where it forms the backbone of Cape York Peninsula but broadens gradually S in a fold parallel to the coast reaching its highest summits in the S where it is known variously as the New England Range the Liverpool Range the Blue Mountains and the Australian Alps. Mount Kosciusko is the highest peak (7350 ft). The inner slope of the Dividing Range descends in terraces to the E lowland which is in parts below sea level.

**Rivers** The Murray and Darling in the SF are the most considerable rivers. The Darling flows SW and the Murray W from the inner side of the Great Dividing Range converging near Wentworth on the N frontier of Victoria. The principal tributaries are the Condamine the Lachlan and the Murrumbidgee. Other important rivers are the Flinders flowing NW to the Gulf of Carpentaria and the W

Australian rivers, the Swan, Murchison, De Grey, and Fitzroy, together with numerous minor streams. The E-coast rivers are short, and in some cases little more than creeks. The Brisbane, Burdekin, Richmond, Clarence, and Fitzroy are the chief. Large tracts of central Australia are entirely without rivers, and many others dry up in mid-course or flow into one or other of the salt lakes.

**Lakes** There are several large saline lakes, the centres of intermittent inland drainage in the depressed parts



Kangaroo

of the S.E. deserts. The largest are Lakes Eyre, Torrens, and Gairdner. Cooper's Creek, a long river in the N.E., drains to Lake Eyre. Smaller lakes are numerous in the same area, all are brackish.

**Climate** Australia, except its N extremity and the S coastal districts, lies within the belt of the S.E. trades. Almost all the regular rainfall is on the S.E. side of the continent, from the tropic of Capricorn to Cape Howe, it is heaviest in the higher regions of the Great Dividing Range, a light fall, however, is deposited on the plateaux and downs to the W of the watershed,

adequate for pasturage but not for agriculture, which depends on irrigation. The heaviest rainfall is in summer. The interior W of 140° E. is almost entirely desert. The tropical N.E. has monsoons in summer. The S.W. and S.E. angles of the continent have a Mediterranean climate, and land and sea breezes bring a small rainfall to the fringe of the W coast. Temperatures through Australia are fairly high, with a narrow seasonal range. The interior is intensely hot and dry.

**Flora** There is a broad forest belt in the many areas extending along the whole E coast, and reappearing in the S.W. Softwoods predominate in the N.E. Typical trees of the temperate region are the eucalyptus, gum (blue and red), acacia, and evergreens of various kinds. Hardwood trees, karr and jarrah, are characteristic of the S.W. Among other trees peculiar to Australia may be mentioned the iron bark, cabbage palm, and stringy bark. The E and S.E. coastal forest shades through a savannah belt to the vast natural grazings, of which the Darling Downs are the most famous. The plant life of Australia is very remarkable, many types of vegetation being preserved which are known only as fossils in other continents. The bush has a leathery foliage, owing to the extreme dryness of the atmosphere.

**Fauna** Australian animal life is as peculiar as that of its plants. marsupials and other types, long since extinct elsewhere, are still preserved. Australia is believed to have formed at one time part of an ancient S. continent, of which large sections are submerged under the Indian and S Atlantic Oceans. It was apparently cut off before the evolution of the predatory mammals now native to the tropical regions of the remaining continents. The kangaroo, opossum, and wombat are the best-known marsupials. Perhaps the most remarkable testimony to the antiquity of animal life is the duck-billed platypus, which unites the characteristics of reptile, mammal, and

bird. Other specimens of distinctively Australian fauna are the spiny echidna, the running birds emu and cassowary, the lyre bird and honey eater, the dingo or wild dog, the bandicoot. Rabbits introduced by white settlers have proved a destructive pest. The crocodiles and lizards of the N. rivers seem to prove an archaic affinity with Asia. Australia has numerous species of snakes, some of them venomous.

**Minerals.** Australia is very rich in accessible minerals which occur both on the superficial sedimentary rocks and in the deep underlying strata. Tin and gold are found as widely distributed alluvial deposits. Those minerals which have been most vigorously exploited are within easy reach of the coast, and the most important are either related to the E. mountain fold or else occur as quartzite reefs exposed by prolonged denudation on the W. Plateau. Coal of several varieties is now Australia's most valuable mineral. It is found in most parts of the continent. The New S. Wales field centred about Newcastle is at present the most important in Australia, and the chief source of coal S. of the Equator. Iron is found in S. and W. Australia, copper in Tasmania, N. Queensland, and S. Australia, tin in Tasmania, N. and S. Queensland. The gold mines of Victoria are becoming exhausted, and the W. Australian reefs are now the most important source; the output is mostly mined in Australia. Silver lead is mined in Tasmania and at Broken Hill (New S. Wales). Salt, gypsum, phosphates, and bauxite occur in the softer superficial rocks. Gems are found in various parts of the continent (opals, sapphires, and rubies).

**Government.** Australia is a British Dominion under a Federal Government set up in 1901 as the Commonwealth of Australia. The original States are the six old colonies—New South Wales, Victoria, Queensland, S. Australia, W. Australia, and Tasmania. In 1911 the N. Territory was taken

over by the Commonwealth Government which experimentally divided it in 1917 into N. Australia and Central Australia, the division being abolished in 1931. The Commonwealth Government also administers Papua, Norfolk Island, and the mandated territory of New Guinea. The legislature consists of the King (represented by the Governor-General), a Senate, and a House of Representatives. There is universal adult suffrage. Federal legislation controls external affairs, defence, banking, and the



Sheepshearing in New South Wales.

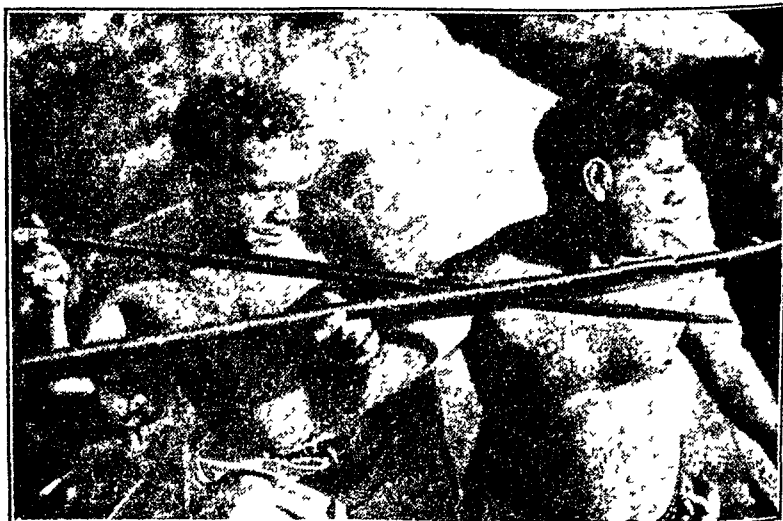
public services and extends to arbitration in commercial disputes between the federated States. The executive power is vested in the Crown and exercised by the Governor-General with the assistance of an Executive Council. The Federal capital is Canberra, where the new Parliament House was opened in 1927. Australia is a member of the League of Nations. In 1933 W. Australia voted for secession from the Commonwealth.

**Production.** Mining, stock raising, and agriculture are the most important occupations. The total area under crops in 1930-1 was over 25 million acres, of which nearly three-quarters were devoted to wheat.

culture and the production of wine are being developed. Gold has become less important since the development of the S African fields. The most valuable mineral worked is coal, others are silver, copper, lead, and tin. Shorn wool and skins are, after farm produce, the most valuable exports (total production, 1930-1, 912 million lb). Cattle, horses, and pigs are reared in considerable numbers. Forestry, dairying, and bacon-curing are

australian commodities. Under the Customs Tariff Acts of 1921-31, Australia was a highly protected State, giving a preference to goods shipped direct from the United Kingdom. During 1930-1 external trade is estimated to have decreased in volume by nearly 50 per cent. For subsequent modifications of Australia's fiscal policy, see OTTAWA CONFERENCE.

*Population.* Australia is thinly inhabited except on the S E and E, and



Australian Aborigines

growing industries (production, 1930-1, nearly £320 millions).

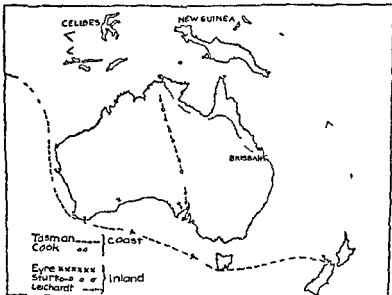
*Commerce.* The principal exports from Australia are wool, wheat, butter, meat, sugar, fruit, dried and canned fruits, hides, and tallow. The chief imports are textiles, petroleum, drugs and chemicals, paper, books, electrical machinery, iron and steel, tea, and tobacco. In 1930-1 more than one-half of the Australian trade was with the Empire, an overwhelming proportion going to the United Kingdom. Japan, France, and Germany also import considerable amounts of Aus-

even here the pop is concentrated mainly in the great ports of the S E. About 98 per cent are of British origin and speech. The largest cities are Sydney (1,256,200), Melbourne (1,030,700), Adelaide (324,300), Brisbane (317,100), and Perth (209,700). Pop estimated (1932) 6,550,000 (46 per cent Anglicans, 22 per cent Roman Catholics, most of the remainder Nonconformists). The Australian Government has pursued an exclusive racial policy: most of the few Asiatic immigrants consist of the Chinese pearl fishers in the N E.

**Aboriginal Race** The survivors of the primitive inhabitants are found chiefly in the N and do not exceed 60 000 in number they are a declining race Like the flora and fauna they represent an archaic survival they are perhaps related to the ancient Malayo-Indonesian race they are dark brown in colour with black wavy hair and a retreating forehead Or ganised in exogamous clans they have

cults having as their base a confused worship of the forces of life and of man as their highest expression and a yet more vague conception of a super natural creator For the dialects of the aborigines see AUSTRALIAN LANGUAGE

**Communications** The railway system is hampered by the multiplicity of gauges due originally to inter State jealousies All new construction is on



Australia Exploration Routes

remained narrow and exclusive in their social grouping and have made no great advance in material civilization Their weapons are flint barbed spears and the boomerang or throwing stick They are nomadic hunters without agriculture or domestic animals and their dwellings are rude temporary shelters of branches Clothing is seldom worn at most amounting to a ceremonial dress of skins The various clans speak different languages and religion finds expression in mythical

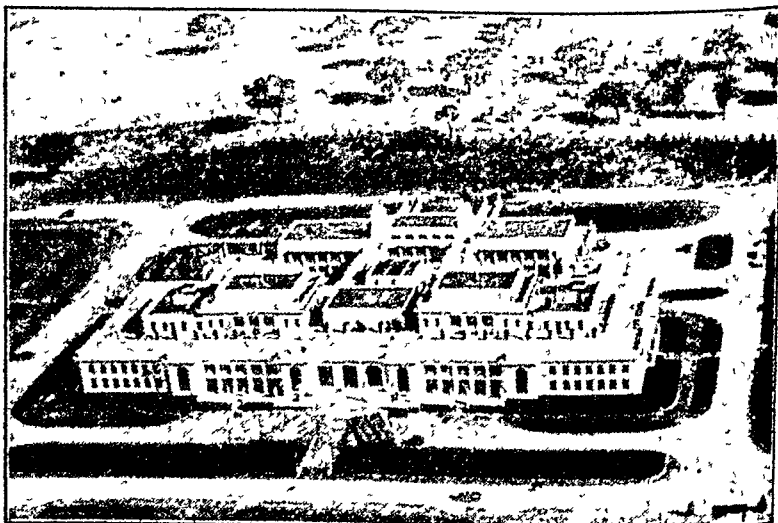
the standard gauge (4 ft 8½ in) The railways are almost wholly under Government control The only completed transcontinental line is the extension of the railway joining Brisbane Sydney Melbourne and Adelaide across the Great Victoria Desert W to Perth via Kalgoorlie though a N-S transcontinental line has made considerable progress Roads are well developed and the motor-car has revolutionised internal transport An overland telegraph runs across the

central deserts to Port Darwin, whence there is cable connection *via* Java and Singapore to British India and Great Britain. Civil aviation is regulated by the Commonwealth Government, which has subsidised 5500 m of air line. Wireless telegraphy is developing rapidly. Two beam stations have been established, to connect with Great Britain, and Central and N. America respectively.

*History* begins with the growth of the colonies at the beginning of the

Britain to emigration to Australia, the colonial history of Australia may be said to owe its development to the Industrial Revolution. See also *BRITISH EMPIRE*.

*Exploration* We learn from Marco Polo, in the 13th cent., that the Chinese knew of the existence of Australia, and at the time of the Renaissance explorations there was a tradition that a Terra Australis, or S. land, existed. French and Portuguese explorers claimed to have set foot on this S.



Government Buildings at Canberra

19th cent. The aboriginal inhabitants can scarcely be said to have had a history in the accepted sense, and have never reached the stage of civilisation at which deliberate record of the past begins. The early British settlements began at the close of the 18th cent. Penal settlements were established at Botany Bay (1788) and Tasmania (1803).

After 1839, however, Australia ceased to be regarded as a dump for social outcasts. Owing to the stimulus given by industrial changes in Great

continent early in the 16th cent. An expedition led by De Torres (1605) may have sighted the N. coast, and certainly threaded the strait between New Guinea and Cape York Peninsula, which bears his name.

The Dutch were the first who are known to have set foot on the mainland. In 1606, the crew of one of their vessels landed on the shores of the Gulf of Carpentaria. During the next half century Dutch navigators coasted down W. Australia, calling the mainland New Holland. The most famous

the Dutch explorers was Abel Tasman who in 1642 discovered the island called after him (he called it Van Diemen's Land) and explored some part of the E coast. The Dutch actually took formal possession of Australia but the inhospitable nature of the land prevented settlement.

The English appeared on the scene in 1688 when Dampier sighted New Holland. He returned later and made an extensive survey of the coasts but was no more impressed than the Dutch by its possibilities. James Cook (qv) who had set out to observe the transit of Venus in 1769 landed in Botany Bay in 1770 and took possession in the name of the British Crown. Cook later surveyed the entire E coast making formal possession.

In 1788 a British colony was formed at Botany Bay. The penetration of the interior was only gradually undertaken. The 19th cent. was a period of much activity under explorers such as Eyre, Sturt, Leichhardt and Stuart. Their treks still left great areas of desert unexplored and later examination concentrated on the great region of W Central Australia. Gosse, Warburton and Forrest established routes between W Australia and the E States (1873-4) and demonstrated the uninhabitability of a large part of the interior.

In 1875 Ernest Giles journeyed from Port Augusta to Perth across the S central deserts. Subsequent expeditions have been inspired by economic rather than scientific motives and so have been much more limited in scope. The Australian explorations of the mid 19th cent. are however worthy to rank with the epoch making discoveries in Africa at the same period both for their range and for the fortitude displayed by the pioneers. A 20th-cent. development is the use of aircraft for mapping uncharted areas and even for geological investigation preliminary to examination on the ground.

**Australian Languages** are spoken by the Australian Aborigines. They have

been classified as N and S but it has not been possible to establish their exact relationship. Two phonetic characteristics are common to all: there is no distinction between *p* and *b* and *t* and *d*; *k* and *g* and there are no fricative consonants such as *f* or *s*.

**Australian Literature** began with the *Creek of the Lou Gehoes* a poem by Charles Harpur (1813-1868) and indeed poetry is its most notable literary feature. Richard Henry Horne (1803-1891) the author of *Orion*, Henry Kendall (1841-1892) and Adam Lindsay Gordon (qv) continue the line of Australian poets—a line which continues to grow and flourish. In fiction the best known books are Marcus Clarke's *For the Term of his Natural Life* and the stories of Rolf Boldrewood (Thomas Alexander Browne) particularly his *Robbery under Arms* (1888). There has also been a considerable body of historical and topographical work.

**Austrasia**, the E part of the Frankish kingdom in Central Europe in the Dark Ages. After the death of the Frankish king Dagobert in 639 Austrasia and Neustria the W part of the Frankish kingdoms had separate kings and capitals. The capital of Austrasia was Metz. The rivalry between the two parts led to wars culminating in the victory of the Austrasians at Vinchy in 711. In the time of Charlemagne the name Austrasia was given to the Frankish lands E of the Rhine.

**Austria** (Ger. *Osterreich* Fr. *Autriche*) a republic proclaimed in Nov 1918 after the World War, situated in Central Europe on both sides of the Danube. It is bounded on the N by Czechoslovakia and Bavaria, on the W and SW by Switzerland, on the S by Italy and Yugoslavia and on the E by Hungary. Area 3 309 sq m.

**Relief.** Modern Austria consists of a lowland cup enclosed by highlands and drained by the Danube. The N borders of the Republic reach up to the Böhmer Wald and the Bavarian and



Moravian plateaux. In the S are the outer ranges of the Alps. To the E the Little Carpathians and the Alpine foreland converge to form the Bratislava "gate" of the Danube between the Austrian and Hungarian plains. The principal mountain chain includes the Tauern ranges of the Alps, with Gross Glockner (12,460 ft) the highest point in the E Alps.

**Rivers and Lakes** Austria is well watered, but only the Enns, a tributary of the Danube, is an Austrian river. The Danube, which flows across the republic from W to E, is the most important waterway. Other large rivers partially in Austria are the Inn (*q v*) and the upper Drave, which waters Carinthia. The glaciers of the Tyrol are a source of drainage by small mountain streams. Lakes are numerous and usually small, especially in Tyrol. The greater part of the Neusiedler See (Fer to Tava) on the Hungarian frontier is in Austria. Other lakes of considerable size are the Atter See and Traun See between Salzburg and Linz.

**Climate.** Austria occupies a frontier climatic zone between Atlantic and continental conditions. The W winds bring a fairly heavy rainfall in summer, at times accompanied by severe thunderstorms. The temperatures are moderate, the average for the hottest month seldom reaches 70° F, but the pronounced seasonal range of temperature (over 35° F) shows the influence of continental conditions. The ordinary Central European forest flourishes, with conifers on the high slopes and deciduous trees (especially beeches) on the lower. The influence of the hot Alpine wind (the *Föhn*) in spring makes vine growing possible, in spite of the relatively low temperatures.

**Commerce and Production.** Modern Austria is mainly agricultural, but her production does not suffice for the great urban centres which grew up when the Austrian Empire was at its zenith, and which have been politically cut off from the agricultural areas that formed part of Austria before the World

War. The Republic is therefore dependent to a great extent on imported foodstuffs, and since her industrial development is not considerable, the economic position of the young State is naturally precarious. The principal crops are cereals (oats, rye, wheat, barley) and root crops (potatoes, turnips, sugar-beet). The forests are one of the most valuable economic resources, and stock-raising is of some importance. Lignite, anthracite, graphite, iron, copper, lead and zinc ores, and salt are mined, some smelting is carried on. The manufacture of raw beet-sugar is a growing industry. There is also a large tourist traffic.

**Finance.** After the World War the Austrian financial system collapsed, and in 1922 the League of Nations devised a scheme for the restoration of the Republican finances, appointing a High Commissioner to implement it. The budget deficiencies were made good by a loan amounting to some £25 millions. Great progress was made under Dr Zimmermann's régime, in 1925 a new currency, based on the "gold" *schilling*, was introduced to replace the hopelessly inflated *krone*, and some progress was made in the repayment of the international debt. With the advent of the world trade depression, however, the budget deficits reappeared, and the Bank of England supported the Austrian State Bank. At the Lausanne Conference in 1932 provision was made for a further international loan of c 300 million schillings (34 6 gold schillings in 1931 = £1 sterling). Great Britain has c £10 millions of capital invested in the Republic, largely as "foreign" credits.

**Population.**—The inhabitants are predominantly of German race and speech, and mostly profess the Roman Catholic religion. The largest town is Vienna, pop (1930) 1,865,800; others are Graz (153,000, 1932), Linz (102,100), and Innsbruck (50,400), and the urban element altogether accounts for at least one-third of the

population Total population (1931)  
8 732 600

**Communications** Some 4200 m of railway were open in 1931. More than one-half of the mileage is operated by the State. Electrification has not proceeded far in spite of the country's vast reserve of water power. There is an efficient telegraph and telephone service and a State-subsidised civil air service (*Oesterreichische Luftfahrts AG*). Over 21 000 m of road are in use of which c. 10 per cent is graded first-class.

**Government** The Constitution of the Republic took its present form in Dec. 1919. The President is chosen by universal adult suffrage holds office for 4 years and may dissolve Parliament; a plebiscite has the power to depose him. Parliament consists of two Chambers: the First Chamber (*Bundesrat*) representing federal interests and chosen by proportional representation from the provincial assemblies and the Assembly (*Nationalrat*) elected by universal suffrage. There are 9 provinces each administered by a popular assembly (*Landtag* or *diät*) of one chamber elected by general adult suffrage and each commune is governed by an elected council presided over by a burgomaster. During 1933 however owing to the crisis caused by the sudden rise of National Socialism and the danger of a move on the part of the Austrian National Socialists to use the Parliamentary institution to unite the country with Germany under Chancellor Hitler the Government was practically a dictatorship moving towards the Italian form of Fascism as opposed to the German.

**Education** There is compulsory primary education at State schools supported financially by the local government areas; there are State-supported high schools, gymnasia and technical colleges and 13 universities.

**Defence** By the peace treaties after the World War Austria's army is restricted to 30 000 effectives voluntarily recruited. She is allowed no navy.

**History** Founded by Charlemagne to guard the Danube corridor into Germany from the Mongolic and Slavonic races of E. Europe Austria soon assumed an importance out of all proportion to its territorial resources; by the later Middle Ages its rulers had advanced to the rank of Dukes of the Empire and had added Styria and the Tyrol to their original territories. In 1273 Rudolph of Habsburg heir of the house which had been building up power in S.W. Germany was elected Emperor and gained possession of Carinthia and Carniola thus sowing the seed of the future Austrian Empire. But it was not until the 15th cent. that the Habsburgs gained the virtually hereditary emperorship of the Holy Roman Empire. In 1522 the German lands of the Habsburgs came to Austria; in 1568 the kingdoms of Hungary and Bohemia were added and in 1699 by the Treaty of Karlowitz Austria obtained Transylvania from the defeated Turks. In the 18th cent. the Austrian Empire was one of the great powers of Europe but a fatal weakness underlay its apparent strength. The unity of the Empire was purely dynastic and derived none of its force from national sentiment. In 1848 the disruptive forces of Slav, Magyar, Austrian and German nationalism flamed out and were suppressed with difficulty by the Government. The establishment of the Dual Monarchy of Austria-Hungary gave a new lease of life to the Empire by recognising the nationalist ambitions of the strongest subordinate races and the Austrian power benefited also by its extrusion from Germany after 1866. Nevertheless the Empire remained compact of infusible racial elements which broke apart in 1918 under the strain of the World War. Republican Austria today is for all practical purposes identical in area with the domains of the 13th-cent. dukes.

**Austria-Hungary** the official title of the heterogeneous Empire of the Habsburgs in Central Europe from

mid-19th-cent. until 1918 The composite State included the Empire of Austria (German Austria with Bohemia and Austrian Poland) and the Kingdom of Hungary, including Transylvania and Croatia The provinces of Bosnia and Herzegovina were annexed in 1908 After 1918 most of the dependent non-German territories were partitioned among Italy, Rumania and the new States of Czechoslovakia, Yugoslavia, and Poland (*qq v*)

**Austrian Literature.** In the Middle Ages this consisted mainly of religious and chivalrous poetry Following the movement of enlightenment (*Aufklärung*), the famous *Burgtheater* came into existence in the 18th cent Modern literature is represented by a number of lyric poets, such as Hugo Hofmannsthal, Hans Müller, and Anton Wildgans, by novelists like Arthur Schnitzler, Bartsch, and Rudolf J Kreutz The drama was closely associated with the Vienna *Burgtheater* until a rival to this appeared in Max Reinhardt's *Theater in Der Josefstadt* Karl Schönherr, Wertheimer, Wildgans, and Richard Billinger are among the more prominent dramatists On the whole, it is more convenient to consider Austrian literature as a part of German literature (*q v*)

**Austrian Succession, War of the.** In a Pragmatic Sanction issued in 1720, the Emperor Charles VI regulated the succession to his vast estates he was to be succeeded by his daughter Maria Theresa This settlement was accepted by Austria and Hungary and recognised by the rulers of the Great Powers On the death of Charles VI Frederick II of Prussia laid claim to parts of Silesia and Spain, Bavaria and Saxony to other parts of the territory War was declared In 1740 Frederick invaded Silesia, and defeated the Austrian Army at Mollnitz in 1741 The French and Bavarians invaded Bohemia and marched on Prague In the next 2 years the Austrian forces were able to hold their own, and in 1745 an alliance

was formed between Austria, Britain, Holland, and Saxony. The Austrian and Saxon Armies were defeated, and peace was signed at Dresden in 1745 Frederick gained Silesia, in Italy and Holland also the Austrian allies were defeated The naval operations were more successful from the point of view of the Austrian alliance The war was finally concluded by the Peace of Aix-la-Chapelle in 1748

**Austroasiatic Languages,** a family of languages spoken at one time throughout N E India and Indo-China Their chief modern representatives are Nicobaric and Munda Phonetically, grammatically, and syntactically they are extremely simple

**Austronesian Languages,** a collective term applied to the Indonesian, Melanesian, and Polynesian languages (*qq v*) One of their characteristics is the fact that the first person dual and plural has two forms inclusive, which includes the person addressed, and exclusive, which excludes him

**Authorised Version, see BIBLE.**

**Autobiography,** the life or biography (*q v*) of a person written by himself Early and famous examples are the *Confessions of St Augustine*, the *Autobiography of the Arch-priest Avvakum*, and the *Autobiographies of Benvenuto Cellini* and *Casanova* Rousseau's *Confessions* are the parent of modern autobiography, which has become a very popular form of literature

**Autoclave, see CHEMICAL ENGINEERING**

**Autocoids, see HORMONES**

**Auto da Fé, literally, "Act of Faith."** The name given to the public trial of heretics by the Inquisition in Spain and Portugal If the accused was found guilty of heresy, he was put to death, either by burning or by strangling

**Autogiro, see AEROPLANE**

**Autograph,** the term applied to a document written or signed by the person who originates it; also to a signature, more particularly to the

signature of a famous person. The Cottonian collection of original documents in the British Museum formed by Sir Robert B. Cotton (1571-1631) comprises a great number of documents of value for their historic interest. Between 1865 and 1868 there appeared *Facsimiles of National MSS from William the Conqueror to Queen Anne* (ed. Sir H. James Rolls Series). In 1893 W. J. Hardy published *The Handwriting of the Kings and Queens of Scotland* and in 1896-1900 the British Museum issued a series of *Facsimiles of Royal Historical and other Autographs in the British Museum*.

**Autolycus** (1) Son of Hermes in Greek mythology and a master thief who could change the appearance of the sheep and cattle he stole from his neighbours. He was detected by Sisyphus who burnt a name on the hoofs of his cattle and so identified them later. Autolycus was the grand father of Ulysses. (\*) Name of a character in Shakespeare's *Winter's Tale*.

**Autolycus of Pitane** (c. 310 B.C.) a Greek mathematician whose work in astronomy related to the rising and setting of fixed stars. He was an early experimenter in spherical geometry.

**Automatic Control.** An important feature in the growth of modern industry is the increasing refinement with which both newly invented and long known processes are carried out. The increased scale of operation renders mistakes made by charge hands or workers very much more serious financially than in the past when operations were carried out on a much smaller scale. Precautionary measures are therefore important. The chief of these consists in replacing the human individual by an automatic device.

The essential point is that the particular factor to be watched over, such as for example temperature, speed, pressure, etc., should be capable of measurement by an instrument and that its regulation

should be possible by some fairly simple process such as adjusting a valve supplying liquid or gas or a rheostat controlling electric current. In the simplest case the instrument may be constructed so as actually to perform the operation without the intervention of any mechanism at all. In chemical laboratories thermostats working on the principle illustrated in Fig. 1 are very much used. They consist merely of a very much enlarged liquid in glass thermometer which is immersed in the liquid whose temperature is to be kept constant. This liquid is heated

by a gas burner usually very small and the gas supply is taken to this burner through a pipe which leads down close to the surface of the mercury. If the latter rises by a very small

amount it cuts off the gas supply altogether except for a by-pass jet. Hence the temperature of the bath rises to the point of cut-off, then sinks slightly, again rises as the gas is re-lit, and so on.

A common form of automatic control is the governor whereby centrifugal force is utilised by the movement of metal balls to open or close a steam valve as their rate of revolution increases or decreases and the circle they describe expands or contracts. The governor of a gramophone motor is an adaptation of this principle. It is obvious that a limit is set to such methods by the force required to make the necessary adjustments. The thermostat for instance can directly control the gas issuing from a  $\frac{1}{4}$  in jet, would be ridiculous to attempt to make it large enough to control supply passing a 6-in. main.

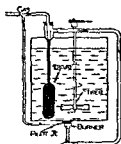


Fig. 1

course is therefore usually had to what is called a relay, that is, a device which, when operated by very low power, makes use of another source of power to pass on the effect

Supposing, for example, that we wish to control the temperature of a large gas burner, an electrical pyrometer (*see* TEMPERATURE, MEASUREMENT or) being used to measure the temperature. The indicating instrument has a fine pointer tipped with platinum, and two platinum contacts are provided close to the point on the scale of the temperature which we wish to maintain. If the indicator rises above the latter temperature, it makes contact on one of the fixed contacts, if it falls it touches the other. Such contacts can only carry a very minute current, but if these currents are led to a relay the latter will switch on or off, as required, a source of current applied to an electric motor or motors, which open and close the gas valve through which the furnace is fed. The indication of almost any instrument can be relayed in a similar manner, and made to control whatever it is indicating. An electrical relay is by no means necessary or even commonly preferred, as it is always very difficult to be sure that electrical contacts made with very little power will be reliable. The best alternative is air under pressure or suction.

The *triode valve* (*see* WIRELESS), a relay of very great sensitiveness, is rapidly being adapted for the purposes of automatic control. In conjunction with the photo-electric cell, it can be used to respond to very slight changes in illumination by any kind of action. Hence any instrument, no matter how sensitive, capable of giving a visible indication can also be made to work a relay, thus the tiny spot of light from a mirror galvanometer (*see* ELECTRIC MEASURING INSTRUMENTS) can be arranged to control a source of electric power of any magnitude. Also all the different changes in objects which we observe with our eyes, such as colour, transparency, turbidity, and so on,

can be made to act directly on the relay, in this way watch is kept over the colours of products, such as cigars, the clarity of liquids, the smoke issuing from a chimney, and the intensity of daylight itself. Street lamps, for instance, can be switched on automatically when the illumination falls below a certain limit, and in many cities they are switched on and off at pre-determined hours by automatic time switches controlled by clockwork.

**Automatic Machine, see SLOT MACHINE**

**Automatic Writing, see PSYCHICAL RESEARCH**

**Automatisation, see PERCEPTION (Psychol)**

**Automaton**, the name given to a figure resembling a living creature or animal, and capable of performing, by means of hidden mechanism, one or more life-like actions. This excludes marionettes and similar figures which are worked by human agency, and have been known from the very earliest prehistoric times. It was apparently in late Greek times that true automata, that is to say, figures moved by motive power such as water and clockwork and even steam, were first made. It is possible that devices of this kind were used in some Greek and Egyptian temples as a means of deceiving the faithful, but we have no definite information on this point. In the 18th cent. the competition between the numerous Courts in Europe, many of them possessing great revenues, led to their insatiable demand for amusing distractions being supplied by, among other things, mechanical automata of almost incredible complication and ingenuity. Mechanical birds which sang, though already known to Hero of Alexandria, were now produced in the most elaborate forms, generally worked by clockwork.

The highest point of complication and ingenuity was reached in the latter half of the 18th cent by the writing figures produced by Von Knauss and P Jaquet-Droz. These

could be set to write a few words consecutively. Their repertoire was varied by changing the set of controlling cams. They could also write letter by letter to dictation and were thus the true fore-runners of the modern typewriter. But unlike this purely utilitarian instrument they were works of art as well as mechanisms and the writing was performed by a life-like figure holding an ordinary pen. The *androïdes* of Jaquet Droz and Leschot are still to be seen in an excellent state of preservation in the Historical Museum of Neuchâtel. Jaquet Droz then constructed automata which sketched and also others which played instruments. The drawings were executed by a pencil held in the hand of the figure and were operated by means of cylinders provided with cams which guided the movements of the pencil. *La Musicienne* was a charming figure in the costume of the period seated at a key-board. While a marvel of design such an apparatus is not so astonishing as the writing and drawing figures. One of the most celebrated of all automata is the *Joueur de Tympanon* made about 1785 by David Röntgen and now in the Conservatoire National des Arts et Métiers in Paris. This figure plays a dulcimer.

A number of figures worked by concealed human beings attained a great vogue in the early 19th cent. the most famous of which were chess-players. The first of these was constructed in 1796 by Baron Wolfgang von Kempelen for Maria Teresa of Austria, and was shown to Catherine of Russia who played a game with it.

Quite recently all the resources of modern engineering, electricity and electrical sound reproduction have been employed in the construction of an impressive robot (*q.v.*) See **CLOCKWORK TOYS**.

**Automobile**, see **MOTOR-CAR**.

**Autonomy**, the principle of national or racial self-government as opposed to government by a foreign or conquering power. The development of

the British Empire is marked by an increasing degree of autonomy accorded to the colonies and dependencies culminating in the almost complete independence of the self-governing dominions. Autonomy was one of the guiding principles of the 1919 peace treaties, the subject-peoples of the German and Austro-Hungarian Empires being formed into the new autonomous and independent States of Czechoslovakia, Poland and Yugoslavia.

**Auvergne** (*pron* ô vârn) ancient province of Central France now divided into the Departments of Cantal, Puy-de-Dôme and a part of Haute-Loire. The surface is very mountainous; chief peaks are Plomb du Cantal, Mont Dore and Puy de Dôme. Agriculture thrives in the valleys. There are numerous spas. The province derived its name from the Arverni, the redoubtable adversaries of Cæsar. In the Middle Ages Auvergne formed a county, later partitioned into four fiefs. Henry II of England at one time held part of the county which was gradually absorbed into the royal domain of the French kings.

**Auxerre**, town on the Yonne and capital of the Yonne Department. There are many interesting churches, that of St Étienne at one time the cathedral being a magnificent example of Gothic architecture ranging from the 13th to 16th cents. The one-time Law Court is now the museum containing antiquities and paintings. Cloth is manufactured and some trade done in wines and timber. Pop. c. 9,000.

**Ava** (*Yadanapura*) town on the middle Irrawaddy, formerly the capital of Burma (A.D. 1364-1763) but now in ruins. It was superseded as capital in 1763 by Amarapura, which in its turn was abandoned (1860) for Mandalay.

**Avalanche**, see **MOUNTAINEERING**.

**Avalon**, the final resting place of Celtic heroes, whether King Arthur is supposed to have been carried after

course is therefore usually had to what is called a relay, that is, a device which, when operated by very low power, makes use of another source of power to pass on the effect

Supposing, for example, that we wish to control the temperature of a large gas burner, an electrical pyrometer (*see* TEMPERATURE, MEASUREMENT OF) being used to measure the temperature. The indicating instrument has a fine pointer tipped with platinum, and two platinum contacts are provided close to the point on the scale of the temperature which we wish to maintain. If the indicator rises above the latter temperature, it makes contact on one of the fixed contacts, if it falls it touches the other. Such contacts can only carry a very minute current, but if these currents are led to a relay, the latter will switch on or off, as required, a source of current applied to an electric motor or motors, which open and close the gas valve through which the furnace is fed. The indication of almost any instrument can be relayed in a similar manner and made to control whatever it is indicating. An electrical relay is by no means necessary or even commonly preferred, as it is always very difficult to be sure that electrical contacts made with very little power will be reliable. The best alternative is air under pressure or suction.

The *triode valve* (*see* WIRELESS), a relay of very great sensitiveness, is rapidly being adapted for the purposes of automatic control. In conjunction with the photo-electric cell, it can be used to respond to very slight changes in illumination by any kind of action. Hence any instrument, no matter how sensitive, capable of giving a visible indication can also be made to work a relay, thus the tiny spot of light from a mirror galvanometer (*see* ELECTRIC MEASURING INSTRUMENTS) can be arranged to control a source of electric power of any magnitude. Also all the different changes in objects which we observe with our eyes, such as colour, transparency, turbidity, and so on,

can be made to act directly on the relay, in this way watch is kept of the colours of products, such as cigars, the clarity of liquids, the smoke issuing from a chimney, and the intensity of daylight itself. Street lamps, for instance, can be switched on automatically when the illumination falls below a certain limit, and in many cities they are switched on and off at predetermined hours by automatic switches controlled by clockwork.

**Automatic Machine**, *see* SELF-ACTING MACHINE

**Automatic Writing**, *see* PSYCHIC RESEARCH

**Automatisation**, *see* PERCEPTION (Psychol.)

**Automaton**, the name given to a figure resembling a living creature, animal, and capable of performing, by means of hidden mechanism, one or more life-like actions. This excludes marionettes and similar figures which are worked by human agency, and have been known from the very earliest prehistoric times. It was apparent in late Greek times that true automata that is to say, figures moved by motive power such as water and clockwork, and even steam, were first made. It is possible that devices of this kind were used in some Greek and Egyptian temples as a means of deceiving the faithful, but we have no definite information on this point. In the 18th cent., the competition between the numerous Courts in Europe for many of them possessing great revenues, led to their insatiable demand for amusing distractions being supplied by, among other things, mechanical automata of almost incredible complication and ingenuity. Mechanical birds which sang, though already known to Hero of Alexandria, were now produced in the most elaborate forms, generally worked by clockwork.

The highest point of complication and ingenuity was reached in the latter half of the 18th cent by the writing figures produced by Von Knauss and P. Jaquet-Droz. These

could be set to write a few words consecutively. Their repertoire was varied by changing the set of controlling cams. They could also write letter by letter to dictation and were thus the true fore-runners of the modern typewriter. But unlike this purely utilitarian instrument they were works of art as well as mechanisms and the writing was performed by a life-like figure holding an ordinary pen. The *androïdes* of Jaquet Droz and Leschot are still to be seen in an excellent state of preservation in the Historical Museum of Neuchâtel. Jaquet Droz then constructed automata which sketched and also others which played instruments. The drawings were executed by a pencil held in the hand of the figure and were operated by means of cylinders provided with cams which guided the movements of the pencil. *La Musicienne* was a charming figure in the costume of the period seated at a keyboard. While a marvel of design such an apparatus is not so astonishing as the writing and drawing figures. One of the most celebrated of all automata is the *Joueur de Tympanon* made about 185 by David Röntgen and now in the Conservatoire National des Arts et Métiers in Paris. This figure plays a dulcimer.

A number of figures worked by concealed human beings attained a great vogue in the early 19th cent. the most famous of which were chess players. The first of these was constructed in 1769 by Baron Wolfgang von Kempelen for Maria Teresa of Austria and was shown to Catherine of Russia who played a game with it.

Quite recently all the resources of modern engineering, electricity and electrical sound reproduction have been employed in the construction of an impressive robot (q.v.). See **CLOCKWORK TOYS**.

**Automobile**, see **MOTOR-CAR**.

**Autonomy**, the principle of national or racial self-government as opposed to government by a foreign or conquering power. The development of

the British Empire is marked by an increasing degree of autonomy accorded to the colonies and dependencies culminating in the almost complete independence of the self-governing dominions. Autonomy was one of the guiding principles of the 1919 peace treaties, the subject-peoples of the German and Austro-Hungarian Empires being formed into the new autonomous and independent States of Czechoslovakia, Poland and Yugoslavia.

**Auvergne** (pron *ô-ver-n*) ancient province of Central France now divided into the Departments of Cantal, Puy-de-Dôme and a part of Haute-Loire. The surface is very mountainous, chief peaks are Plomb du Cantal, Mont Dore and Puy de Dôme. Agriculture thrives in the valleys. There are numerous spas. The province derived its name from the Arverni, the redoubtable adversaries of Cæsar. In the Middle Ages Auvergne formed a county later partitioned into four fiefs. Henry II of England at one time held part of the county which was gradually absorbed into the royal domain of the French kings.

**Auxerre**, town on the Yonne and capital of the Yonne Department. There are many interesting churches, that of St Étienne at one time the cathedral being a magnificent example of Gothic architecture ranging from the 13th to 16th cents. The one-time Law Court is now the museum containing antiquities and paintings. Ochre is manufactured and some trade done in wine and timber. Pop. 29,000.

**Ava** (*badinapura*) town on the middle Irrawaddy, formerly the capital of Burma (A.D. 1344-1853) but now in ruins. It was superseded as capital in 1853 by Amarapura which in its turn was abandoned (1886) for Mandalay.

**Avalanche**, see **SLIDE**.  
**Avalon**, the final resting place of Celtic heroes, whether King Arthur or others, supposed to have been carried



receiving his mortal wound Attempts have been made to identify Avalon with Glastonbury and other places

**Avebury, John Lubbock, 1st Baron** (1834-1913), politician and scientist, held important positions in the Unionist Party, and was Vice-Chancellor of London University (1872) His works include a number of books on scientific subjects written in a popular style He was made a baron in 1900 He was president of many scientific societies, and he gained great popularity as being responsible for the passing of the Bank Holidays Act His best-known work is *The Pleasures of Life*

**Avena** (bot), see GRASS FAMILY  
**OATS**

**Aventine Hill**, the second highest of the Seven Hills of Rome, on the left bank of the Tiber

**Aventurine**, see FELSPAR, QUARTZ

**Average**, in shipping, the loss caused by accidents to ship or cargo *Particular average* is damage caused to a specific part by accident and is borne by its owner or his insurer *General average* is loss from extraordinary sacrifices made or expenses incurred for the preservation of the ship, and is borne by the owners of the ship and of the cargo proportionally *Adjustment of average* is the determination of the amounts of the contributions to be made by the persons interested

**Averescu, Alexandre** (b 1859), Rumanian statesman, Minister of War 1907, Chief of the General Staff (1913) in the war against Bulgaria, army commander in World War, and Premier in 1920 and 1926

**Averroes** (*Ibn Roshā*) (c 1130-1198), Arabian philosopher He studied theology, philosophy, and jurisprudence, succeeded his father as a judge, and wrote his famous comments on Aristotle In addition to this work he wrote a number of tracts on philosophy, medicine, and jurisprudence His theory of the "universal soul" played a large part in mediæval philosophical controversy

**Aveyron** [*pron* AVAR'ONG], Department of S Central France W of the Cevennes and S of the Auvergne It is watered by the Rs Lot, Aveyron and Tarn The surface is mountainous or rocky, and rather sterile Potatoes and some cereals are grown and fruits (vines, apples, and mulberries) cultivated in the more sheltered valleys The district is famous for its Roquefort cheeses There are large forests, and some coal is mined in the W of the Department Other minerals are iron, zinc, and lead The Department is remarkable for the number of its memorials of prehistoric culture menhirs, dolmens, etc Chief towns are Rodez, Villefranche de Rouergue, and Millau Area, 3381 sq m, pop (1931) c 323,780

**Aviary**, a structure or enclosure in which wild birds, as opposed to domesticated breeds, are kept in captivity It should, of course, be sufficiently large to allow the inmates to exercise their natural activities as far as possible A simple aviary may be made of a wooden framework covered with wire-netting, but a light iron framework is more elegant, and has the advantage of being more easily cleaned At the back of the aviary there should be a shed in which the birds can take shelter at night or during stormy weather, and this, if possible, should be heated and provided with sliding glass doors so that on cold winter nights delicate tropical birds may be shut in Both the shed and the outdoor portion of the aviary should be furnished with perches, preferably natural branches, varying in thickness to suit the feet of the larger and smaller species For small birds, growing evergreen shrubs are an appreciated addition, and add greatly to the picturesqueness of the enclosure Shrubs, however, are useless for parrots, which destroy all foliage

The floor of the outer compartment of the aviary should be half grass and half gravel, but the turf, since it cannot be cleaned, should be periodically

renewed. The floor of the shed should be sanded to facilitate cleaning. Water should be always available and there should be at least one hallow trough or tray for bathing. Food should be given in dishes either placed on the ground or attached to the wire work.

The aviary should have a S aspect but facilities must be given for sheltering from the direct rays of the sun in summer. Some form of shelter from the collier winds from the N and E is also useful.

Opportunities for breeding should be provided by supplying material for nests and nesting boxes may be fastened to the wire work for the species which under natural conditions nest in the holes of hollow trees.

Destructive vermin such as rats are kept out by continuing the wire work for a fair depth into the soil where the end of the netting should be turned outwards.

See also AVICULTURE

Aviation, see AERIAL NAVIGATION  
AEROPLANE AIRCRAFT HISTORY OF  
AIRSHIP BALLOONS CIVIL AVIA  
TION

Avicbron (*Salomon Ben Judah Ibn Gabirol*) (1020-1070) Jewish poet and Neoplatonist philosopher. His chief work *Fons Vita* expounded a metaphysical theory of the nature of God.

Avicenna (*Ibn Sina*) (c. 980-1037) an Arabian physician whose main work the *Canon of Medicine* was a standard book for five centuries. Avicenna showed an early aptitude for philosophy and medicine held official State posts and travelled and lectured in the E. He died while on military service for the prince of Ispahan.

Aviculture may be defined as the keeping of wild birds in captivity. For this a knowledge of their natural diet is essential and on this basis most cage birds are divisible into two groups the seed-eaters and the insect-eaters although many are mixed feeders. Finches waxbills and weavers are typical seed-eaters and should be

fed mainly on canary and millet seed. Their young however are reared on insects and if breeding the parents should be given insectivorous food for their nestlings. This food a substitute for live insects is also essential for the insect-eaters or soft billed birds which as a class may be distinguished from the typical seed-eaters by their delicate beaks.

A good mixture of insectivorous food can be made of so-called ants eggs and dried flies finely cut up meat and hard boiled egg mixed with breadcrumbs but this food must be fresh. Meal worms the only suitable food obtainable throughout the year in this country may also be used at all events for the larger birds.

When the diet of a bird is not known a choice of these foods should be given and fruits of various kinds tried as well.

Parrots eat grain seeds fruits and nuts and bark-covered branches to peck are always welcomed. Most doves and pigeons are also grain-eaters but a few of the imported species eat fruit as well. Raw meat is usually the only food regularly obtainable for owls and hawks but rats mice and other vermin or sparrows should be supplied when possible.

Most of the smaller birds live peaceably together but overcrowding should be avoided and quarrelsome specimens excluded and birds of prey and egg eaters must be segregated.

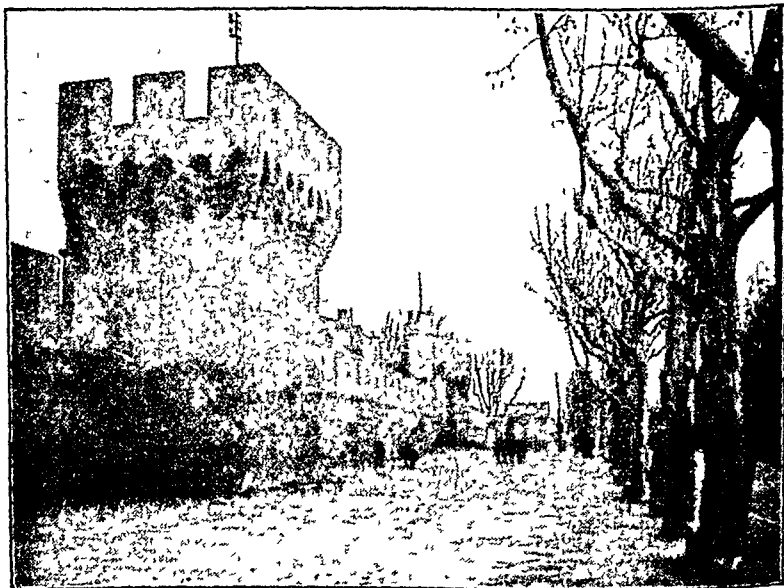
See also AVIARY

Avignon (*pron* AVENYONG) city of S.E. France on the E bank of the Rhône c. 160 m S of Lyons capital of the department of Vaucluse. It is an important railway centre with manufactures of chemicals leather and soap. The city is associated with the Babylonian Captivity of the Popes from 1309 to 1377 when they resided in the city practically as puppets of the French kings. The 14th cent. palace of the Popes is the most famous building in the city the town walls also built by the Popes in the 14th cent. are

standing There is a Romanesque cathedral and a number of mediæval churches

Avignon was an important town in Narbonnese Gaul in Roman times, becoming a bishopric in the 3rd cent AD After a brief period as a republic at the end of the 12th cent, it fell under the sway of the Counts of Provence, who in 1348 sold it to Pope Clement VI It remained a Papal

abundant (2) Capital of Avila province, on the Adaja, built high up on a rock, pop 13,000 The ancient monuments include the city walls, the Gothic Cathedral (13th-14th cent), and several other churches The convent of St Teresa is built on the site of the house where she was born (in 1515) The town houses of the Castilian nobility recall the splendour of the Middle Ages Altogether Avila



Avignon City Walls and Battlements

possession till 1791, when it was annexed by the Revolutionary Government Pop (1931) 57,200

Avila: (1) Province of Central Spain, area 3042 sq m, pop (1931) 222,688 The N is agricultural, and fairly level, is subjected to long and severe winters The Adaja R enters from Valladolid and emerges c 40 m SW of the capital, Avila, from which point the province is a mass of hills and forests, culminating in the Sierra de Gredos Silver, copper, and iron are

is one of the most interesting towns in Spain

Avoca, or Ovoca, vale in co Wicklow, Irish Free State, famous for its beauty and antiquities, and immortalised by Tom Moore in *Vale of Avoca*

Avocado or Alligator Pear, is the fruit of a kind of laurel which grows in tropical America The fruit is a dark-coloured, pear-shaped berry with an oily deliciously flavoured pulp The oil is also used as a black stain.

**Avocet**, a black and white shore bird of the plover tribe distinguished by its long slender up curved bill



Avocet

**Avogadro's Law** in physics—that equal volumes of gases at the same pressure and temperature contain equal numbers of molecules—has become an important principle of the atomic theory. *See also* CHEMISTRY

**Avogadro's Number** *see* ATOM

**Avon**, the name of a number of streams and rivers in the British Isles especially (1) The UPPER or WARWICKSHIRE AVON rising near Naseby and flowing past Rugby Warwick Stratford and Evesham to join the Severn at Tewkesbury About 100 m in length the river is navigable up to Evesham for small craft ( ) The BRISTOL AVON draining the Cotswolds and flowing first E across Wiltshire then turning W and entering the Bristol Channel at Avonmouth through the Clifton gorge The lower stream is commercially important in connection with the port of Bristol Length c 75 m (3) The HAMPSHIRE AVON rising near Marlborough and flowing S past the W edge of the New Forest to Christchurch on the English Channel It is c 60 m long Avon is a word of Celtic derivation signifying water

**Avonian**, *see* GEOLOGY

**Axil** (bot) the angle between leaf and stem, in which a vegetative or flower bud is usually formed

**Axis Deer** *see* DEER

**Axla**, *see* BEARING

**Axminster** a market town and urban district of S E Devonshire on the small R Axe some .5 m from Exeter It is situated at the junction of the old roads Fosse Way and Icknield Street The carpets with which its name has long been associated were first manufactured there in the middle of the 18th cent but the industry is now carried on at Wilton The minster church exhibits all the developments of mediæval architecture from Norman to late Gothic Pop (1931) 9300

**Axolotl**, an animal belonging to the group of salamanders and newts (*qqv*) It is remarkable for being able to mature sexually a the larval form It is a native of the United States and Mexico In Mexico where the surrounding country is barren and arid it is found as an aquatic form breathing by means of its gills and does not develop beyond the larval stage In the United States it assumes the land form in the ordinary way

The axolotl was formerly regarded as the adult form until some captive specimens in the Jardin des Plantes underwent metamorphosis Metamorphosis can now be brought



A axolotl

about artificially by administration of extract of the thyroid gland

The larva may be 1 ft. in length, and is eaten in Mexico

**Ayacucho, Battle of** (S American War of Independence) (Dec 9 1824) the Patriots under Sucre (6000) decisively defeated the Spaniards under Laserna the Viceroy (10 000) who lost 2100 killed and wounded including Laserna and 2500 prisoners as against 980 of the Patriots Practically secured

the independence of S America Known also as the Battle of Candorcanqui

**Ayala, Ramón Perez de** (b 1881), Spanish writer, has published three volumes of verse and many essays and novels, all marked by a bitter irony. *Prometeo*, *Luz de Domingo*, and *La Caída de los Lemories* have been translated into English. One of his most popular books is *Belarmino y Apolonio*, a humorous novel (1921)

**Aye-aye**, a peculiar species of Lemur found in Madagascar. It is at once distinguishable by its long, shaggy, blackish hair, and huge naked ears, but is chiefly remarkable for the modification of the front teeth for gnawing, as in rodents (q v). It is a nocturnal, arboreal animal, and feeds largely on insects, especially wood-boring grubs, which it extracts from their burrows by means of one of its fingers, which is very long and thin for the purpose

**Ayesha** [ASH'Ū] (610-677), the second and favourite wife of Mohammed, and daughter of Abu Bakr, the prophet's successor as Caliph

**Aylesbury**, county town of Bucks, with thriving trade in agricultural produce, the ducklings, reared on the farms near by, are a famous delicacy. Printing is an important industry. Pop (1931) 13,380

**Aylesford, Battle of** (155) the Jutes under Hengist and Horsa (who was slain) defeated the Britons under Vortigern, 3 m N W of Maidstone

**Ayodhya**, ruined city of India on the banks of the Gogra (United Provinces), formerly capital of Oudh. Its former greatness is described in the Hindu epic, the *Ramayana*

**Ayr**, burgh and county town of Ayrshire, industrial town, seaport, and watering-place, at the mouth of the Ayr. There are engineering and chemical works and the harbour is devoted to the coal trade. The Wallace tower recalls the town's history. Pop (1931) 36,700

**Ayrshire**, county of S W Scotland situated on the coast between the Firth of Clyde and Wigtownshire, with Renfrew to the N and Kirkcudbright,

Dumfries, and Lanark to the E. The coast is even and dotted with a few rocky islets, including Ailsa Craig. The interior is hilly in the N E, and rises to some considerable mountains in the S (Black Craig, 2300 ft). Chief rivers are the Ayr, Doon, and Girvan, none of them large. The fresh-water lochs include Loch Doon. Potatoes, oats, and root crops are the staple products, while wheat and dairy farming (especially cheese manufacture) are of increasing importance. Sheep, cattle, and pigs are raised. Industry is chiefly connected with the large coalfield (the second largest in Scotland), of the central lowland. Only two towns—Ayr (36,800) and Kilmarnock (38,100)—are of any size. Ardrossan (q v) is the most active port, others are Ayr, Troon, and Girvan. Area 1133 sq m, pop (1931) 285,180

**Ayrton, William Edward** (1847-1908), English scientist and joint inventor of a series of electrical measuring instruments, was for some time in the telegraphic department of the Indian Government, and later Professor of Electrical Engineering at S Kensington (1881)

**Aytoun, William Edmund** (1813-1865), Scots poet, published his first volume when 17. His most popular collection was the *Bon Gaultier Ballads* (1855). His contributions to *Blackwood's Magazine* included poems and humorous articles

**Azalea**, a shrub with handsome blossoms belonging to the heath family (Ericaceæ) and related to the rhododendron (q v). Introduced from N America and Asia, the azalea, with its large, bright-coloured flowers, is a favourite garden and greenhouse plant in England. Most of the varieties which require dry soil without loan and are known as American or Chinese and Indian, are hybrids

**Azerbaijan**, Soviet republic situated to the W of the Caspian Sea. Area 32,686 sq m, pop (1926) 2,313,172, mostly Tartar. Baku, the capital, is the largest port on the Caspian, and the third largest oil centre in the world.

The population is principally engaged in agriculture corn and cotton and some are employed on the oil fields

**Azides** [pron Az idz] are the salts of *hydrazic acid*  $N_3H$  many azides are explosive e.g. lead azide  $PbN_6$  which is employed in the manufacture of detonators

**Azilian**, a term relating to the latest culture stage of the Palaeolithic period (see STONE AGE)

**Azimuth** see OBSERVATORIES

**Azincourt**, see AGINCOURT

**Azo Compounds**, term applied in organic chemistry to those compounds which contain the grouping  $N-N$ . They are stable substances and are coloured red to orange. This makes some of them of importance as dyes and there are a large number of dye-stuffs known as the azo colours. The colour of azo compounds is due to the group  $N-N$  which is known as a chromophore.

Azo compounds may be prepared by the reduction of nitro compounds under certain conditions. Several of the azo dyes are what is known as substantive dyes that is they have the power of dyeing cloth without the use of a mordant (see DYING).

**Azotic Rocks** see ARCHÆAN SYSTEM

**Azores** group of islands forming an administrative district of Portugal in the central N Atlantic situated c. 800 m from the continent of Europe. Spread over 400 m of sea the archipelago is subdivided into three groups with a considerable distance between each group. The central group comprises Fayal (Faial) St George (São Jorge) Pico Graciosa and Terceira the N.W. Flores (the scene of Grenville's sea fight in 1591) and Corvo and the S.E. St Michael's (São Miguel) the largest island and St Mary (Santa Maria). All the islands are hilly and rise abruptly from a great depth in the ocean. At times they give evidence of their volcanic origin with eruptions of lava and seismic disturbances while hot mineral springs are numerous. The best harbour is Horta on Fayal.

The mild and equable climate favours the cultivation of fruit which is the staple export. Pine apples oranges citrus fruits bananas and medlars are the crops chiefly grown. Tobacco and sweet potatoes are also exported. Some wine is produced and the islands are an important centre of whale fisheries. Coal is imported from Great Britain but most manufactured articles are received from Portugal. The capital is at Angra on Terceira. Area 90 sq m. pop. (1930) 753,600.

**Azores** The Sea Fight of (1591). Seven British ships under Lord Thomas Howard were driven from Flores by the Spanish fleet under Alfonso Bassano. Sir Richard Grenville, commander of the *Paenge*, after a gallant defence against 15 Spanish ships for 16 hours was killed and his ship surrendered.

**Azov** town of USSR in the Caucasian area situated on the lower Don. The only economic activity now is in the fisheries as its harbour has become useless. It was formerly of considerable importance. Tanais of the classical authors was situated in the neighbourhood and the Genoese had a trading post there in the Middle Ages. The town became Russian in 1730 before that it was Turkish. Pop. (1956) 17,500.

**Azov Sea** of N arm of the Black Sea almost enclosed to the S by the isthmus of Crimea. The strait of Kerch or Yankale affords access between the Crimea and the N.W. foreland of the Caucasus to the Black Sea. The sea is shallow and frozen over for part of the winter. The R. Don flows into its N.E. angle and the silt brought down is gradually raising the level of the sea bed. Chief port, Taganrog. Area c. 16,900 sq m.

**Aztecs** a native American people of great antiquity belonging to the Nahuatl speaking division of the great Uto-Aztecan family. They conquered Mexico in the 15th cent. and founded an empire which in its turn was conquered by the Spaniards. See RED INDIANS.

**Azure** see ISRAELDRY

**Baalbek**

**Baalbek**, ruined city NW of Damascus. The remains are of the Roman period. The name is assumed to mean the city of Baal, and the Romans seem to have adapted the ancient Semitic cult to Roman forms. The city was known as Heliopolis in Roman times. The most striking ruin is the Great Temple, erected in the early imperial period. Pop c 4000.

**Babassu Nut Oil** is obtained from the fruit of various closely related Brazilian trees belonging to the palm family. The oil is a non-drying oil similar to coconut oil, and is employed in the manufacture of margarine and soap.

**Babbage, Charles** (1792-1871), English mathematician, wrote much on scientific subjects and helped to found the Astronomical (1820) and the Statistical (1834) Societies. Babbage was greatly interested in errors in calculation, and persuaded the Government to finance his attempt to construct a calculating machine, but after some time its aid was withdrawn and the project failed.

**Babbitt Metal**, a special alloy, named after the inventor, used in engineering for the manufacture of machine bearings, since it possesses anti-friction properties. A typical composition of the metal is tin 83 per cent, copper 9 per cent, and antimony 8 per cent. See also ANTI-FRICTION METALS, ALLOYS.

**Babel**, see BABYLON.

**Bab-el-Mandeb**, strait separating S W Arabia from Africa, between the Red Sea and the Indian Ocean. It is divided by the island of Perim, giving rise to dangerous currents, hence the name (Arabic for the Gate of Tears). The main strait is between 15 and 20 m wide.

**Baber** (1483-1530), conqueror of

**B****Baboon**

India and founder of the Moghul dynasty. After some warfare at Samarkand and Kabul, in 1526, he defeated the Emperor of Delhi at Panipat and captured Agra. Although his army was fatigued and inclined to mutiny, at Kanwaha, in 1527, he defeated the immense army of Rana Sanga, and became master of N India.

**Babiana** (*Baboon-root*), half-hardy bulbous plants belonging to the family Iridaceæ, introduced in 1750 from the Cape of Good Hope. The flowers are blue, scarlet, and white, large and handsome and fragrant.

**Babism**, a religious movement arising in Persia in the 19th cent, originally a reformed and eclectic Mohan medanism, founded by Mirza A. Mohammed, the *Bab* ("gate"), who was put to death in 1850. The creed which is based on belief in a God revealing Himself to mankind through a succession of teachers, has many adherents in Persia, and some followers in the U.S.A. and Europe.

**Babington's Conspiracy** (1585), plot to murder Elizabeth, and place Mary Queen of Scots on the throne. Anthony Babington, who with several others was put to death, was one of the leading conspirators.

**Baboon**, a large, powerful monkey (*q v*) frequenting rocky hills all over Africa S of the Sahara. Distinguished by its dog-shaped muzzle, from which the popular name "dog-faced monkey" is derived. The common instinct of baboons is highly developed and they are almost always found in troops. They throw stones at intruders, have been known to kill leopards that have seized their young and co-operate in raiding plantations. They feed largely on insects, though several may combine to kill and devour a small antelope. There are several

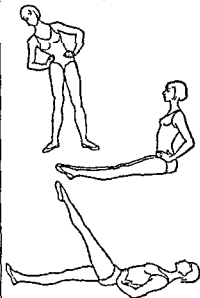
kinds the best known being the *Chacma* from Cape Province and the *Hamadryas* or *Sacred Baboon* from Abyssinia and S Arabia which was venerated by the ancient Egyptians

**Baby farming** the taking in of children to nurse in return for payment a practice which formerly led to much abuse and became a grave scandal in the 19th cent The mortality among such infants generally illegitimate who received but the scantest care and were frequently murdered rose to enormous proportions Under the Infant Life Protection Act 1897 now the Children Act 1908 a person undertaking for reward the nursing and maintenance of one or more infants under the age of 7 apart from their parents or having no parents must within 48 hours of receiving the infant give written notice to the local authority containing the names and addresses of all the parties concerned and the sex date and place of birth of the infant Notice of death or removal of the infant must be given within the same time and in case of death the coroner must also be informed The local authority has the right to appoint visitors to inspect the premises from time to time and to give advice and directions if necessary No policy of insurance can be taken out in respect of such infant by the person maintaining it The punishment for an offence is imprisonment or fine Relatives or legal guardians hospital and religious or charitable institutions established for the care of infants boarding schools at which efficient elementary education is provided etc are exempted from the Act

**Baby Feeding and Care of** It has been said by an eminent authority that perfect health during the first two years of life paves the way for a life time free from major and minor ailments Infinite care should therefore be taken with the feeding clothing and management of the baby It must be remembered that the life of the baby actually begins 9 months before it is born and that the health habits and

feeding of the mother will affect it

The expectant mother should have plenty of fresh air and exercise A daily walk with a few minutes physical jerks every morning are usually sufficient with a moderate amount of domestic duties as well The food should contain fresh fruit and salads vegetables and at least a pint of milk daily cheese and eggs should be eaten fairly frequently meat only



Exercises for the Expectant Mother

once a day and 3 to 4 pints of water in the form of fruit drinks soup weak tea or plain water are also highly desirable

The clothing should be loose and any supporting garment should hang from the shoulder rather than from the waist Straps crossing on the chest will prevent any pressure on the breasts

A few minor ailments often afflict the expectant mother such as constipation morning sickness kidney trouble dental decay and swollen legs. If



these become acute, a doctor should be consulted, but home treatment will usually cure them.

**Constipation** If this still persists when fruit, vegetables, and salads are eaten in ample quantities, and a plentiful supply of water is drunk, a laxative such as liquid cascara may be taken.

**Morning Sickness** Fatty foods—butter, cheese, fat meat, cream, chocolate, kippers, salmon, bacon—should be avoided, also pastries and cakes containing fat. Lemonade, and other fruit drinks, sweetened with glucose and drunk last thing at night, are often beneficial, as well as dry toast and honey for breakfast.

**Kidney trouble** may cause insufficient urination. The amount of meat and fish eaten should be cut down, and it is advisable to give samples of urine to the doctor from time to time.

**Dental Decay** Plenty of cheese, milk, and Vitamin D in the daily food should prevent this.

**Swollen legs** are often caused by pressure in the abdomen, and may be relieved by putting the legs up. Varicose veins need medical attention.

**Babies' clothing** should not be tight, scratchy (a baby's skin is very sensitive), too hot, or too cold, and should be easy to remove. Cellular cotton, linen or silk, and wool are suitable materials. Wide openings at the neck and magyar sleeves make vests, petticoats, and nightgowns easier to slip off. A damp, soiled, and uncomfortable napkin will cause many tears, and nerve strain in the mother. An ample supply (about 2 dozen) of fine absorbent napkins will permit frequent changes. Three or four thicknesses of butter muslin about 23 in square and sewn together are suitable, or squares of soft old linen or cotton. These should be attached by folding in a triangle and pinning the three points together over the abdomen. Another napkin of similar size, but made of Turkish towelling, can be fastened loosely around the body, but not between the legs.

**'s Cot** The best type is a

plain wicker one, with a slightly raised head-end. A soft woollen blanket 2 or 3 ft longer than the cradle, and about 3 or 4 times the width, should be placed in the cradle, lining the sides. On this is placed the mattress, a calico sack containing very fine bed chaff (which can be renewed from time to time), a piece of mackintosh, a small flannel or flannelette blanket, and the pillow. The baby, wrapped in a soft, loosely knitted shawl, is placed on it, the sides and end of the large blanket being then folded over and pinned in position.

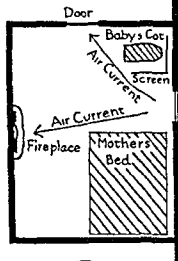
**Nursery** The only time that a baby should require a nursery is in wet or foggy weather. The rest of the time should be spent in a perambulator in the garden, but care should be taken to keep the direct rays of the sun off the baby's face. The most important point to remember in planning the nursery, whether it forms part of the parents' bedroom, or is a separate room, is that the baby needs constant changes of fresh air. Air flowing in at a wide-open window (which should only be closed at bathing time), across the space at the end of the cot to a door or a fireplace, will ensure this. The best floor covering is cork linoleum, which can be easily washed, with some washable rugs. A washable paint or wall-paper in a plain colour should be used.

**Feeding** A baby should be breast-fed for the first 9 months of its life. A sudden change from mother's milk to cow's milk tends to upset the baby's digestion. The proteins and fats of breast milk are more digestible than those of cows', a breast-fed baby is less likely to catch infectious diseases, for it acquires immunity from its mother, the sucking tends to develop the jaw, the milk is cleaner, and the tedious business of washing and sterilising bottles is avoided. With proper care and treatment probably 19 out of every 20 women are capable of breast-feeding. Sometimes the milk is slow in coming, but with patience in hand-expressing, putting the baby periodically to the breast for a few minutes, it

## Bottles

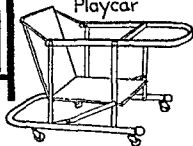


## Plan of Nursery

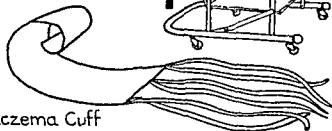


Window

## Playcar



## Eczema Cuff



can be done Four-hourly feeding is usually advised, the baby being allowed about 10 minutes at each breast Both mother and baby should rest at night, no feeding being given between 10 p m and 6 a m It is important that the feedings should be given at exactly the same time every day, usually at 6 a m, 10 a m, 2 p m, 6 p m, and 10 p m

*Test Feeds* Greenish watery stools may mean either over-feeding or under-feeding, a large quantity suggesting the former and small the latter Weighing before and after each feed and adding up the total amount for the day will show how much food the baby is getting Babies vary very much in the amount they need, but it is usually rather less than that required for artificially-fed babies

*Weaning and Feeding after 9 Months* The baby must now get used to taking a new kind of food, given in a different way The changing from breast to cow's milk may upset the stomach, unless carried out very gradually, and drinking from a bottle, cup, or spoon may be resisted very stubbornly by the baby A week or two before weaning a little boiled water sweetened with sugar may be given in a bottle between the breast feed When the weaning has begun it is advisable to give some of the food from a spoon or cup occasionally in order to accustom the baby to this method of taking it From the age of 6 months the jaws should be trained for future mastication by giving a bone to chew, and later at weaning time a hard crust or toast The cow's milk should be diluted according to tables which can be obtained from various infant welfare centres, and the strength gradually increased until the baby is taking full cow's milk at about 1½ years Fruit juice, barley, or oat jelly, porridge, egg custard, vegetable soup, milk-pudding, potato are gradually introduced, until at 1 year old it is ready to take a little fish occasionally, at 2 years it may have meat occasionally, steamed puddings, and so on, until the

child is taking breakfast and lunch of healthy and simple adult foods, and a light supper followed by fruit and plain cake.

*Artificial feeding* should only be resorted to when really necessary—if the mother dies at birth or cannot in any circumstances produce sufficient food for the baby

*Supplementary Feed* Sometimes the mother can breast-feed her baby, but not produce sufficient for its needs To find out whether this is the case, a weight-chart should be bought On this a line is drawn showing the rate at which a baby should put on weight If it is being underfed the line (made by joining up the points where the weight is marked weekly or monthly) will drop Roughly, the birth weight should have doubled at 6 months, and after that the baby should put on about 1 lb a month In cases of underfeeding, a mixture containing as nearly as possible the same ingredients as breast milk is given after each feed

*Artificial Feeding from Birth* The famous child specialist, Sir Truby King, has worked for years to find some milk mixture which will give the unfortunate babies who cannot be naturally fed a chance of growing into healthy adults These mixtures contain milk, lime-water, sugar, and an emulsion of fat and sugar, the quantities varying according to the age of the baby The milk used may be certified Grade A (tuberculin tested), Grade A, or pasteurised These various names give an indication of their quality, certified milk containing the smallest amount of harmful bacteria In places where the supply of cow's milk is doubtful, dried or unsweetened condensed milk can be made up with other ingredients to form a suitable mixture Goat's milk can also be used when it is obtainable Whichever form of milk is used, it is safest to bring it to the boil and then cool quickly A quick and safe method of testing the temperature is to place the bottle (after filling) against the lips

TABLE FOR ARTIFICIAL FEEDING†

Average weight lb.	Age	No. of feedings	Oz. of milk per feed	Total in 24 hrs.	Composition of food		Hours of feeding	
					as man's milk	as boiled water	m.	p.m.
7½	At Birth	—	—	—	—	—	—	—
8½	2nd day	3	1	3	1½	3½	6 10	7 4 10
—	4th day	3	1½	4½	2½	4	6 10	7 4 10
—	6th day	3	2	6	3	3	6 10	7 4 10
—	7th day	3	2½	7½	4	3	6 10	7 4 10
—	8th day	3	3	9	5	2	6 10	7 4 10
7	10th day	3	3½	10½	6	4½	6 10	7 4 10
7½	2nd week	3	4	12	7	5	6 10	7 4 10
—	4th week	3	4½	13½	8	5½	6 10	7 4 10
8½	6th week	3	5	15	9	6	6 10	7 4 10
10½	8th week	3	5½	16½	10	6½	6 10	7 4 10
12½	10th week	3	6	18	11	7	6 10	7 4 10
13½	12th week	3	6½	19½	12	7½	6 10	7 4 10
14½	14th week	3	7	21	13	8	6 10	7 4 10
16½	16th week	3	7½	22½	14	8½	6 10	7 4 10
—	18th week	3	8	24	15	9	6 10	7 4 10
—	20th week	3	8½	25½	16	9½	6 10	7 4 10
—	22nd week	3	9	27	17	10	6 10	7 4 10
—	24th week	3	9½	28½	18	10½	6 10	7 4 10
—	26th week	3	10	30	19	11	6 10	7 4 10
—	28th week	3	10½	31½	20	11½	6 10	7 4 10
—	30th week	3	11	33	21	12	6 10	7 4 10
—	32nd week	3	11½	34½	22	12½	6 10	7 4 10
—	34th week	3	12	36	23	13	6 10	7 4 10
—	36th week	3	12½	37½	24	13½	6 10	7 4 10
—	38th week	3	13	39	25	14	6 10	7 4 10
—	40th week	3	13½	40½	26	14½	6 10	7 4 10
—	42nd week	3	14	42	27	15	6 10	7 4 10

N.B.—Average birth weight 7½ lb.—usually loss of about ½ lb. first 3 d. vs.

N.B.—Breast fed babies gain from 3 to 5 lbs. in first 3 months.

N.B.—Where amount of humanised milk is increased, work should be slowly increasing daily to amount indicated.

Adapted from *The Expectant Mother and Feeding and Caring for Baby* by Sir Truby King

† Add 1 pint of the boiled water to the recipe

† From *The Mother's Manual* by kind permission of the publishers J. & A. Churchill, Gloucester Place W.

**Bottles** can be of two kinds—the upright and the boat-shaped. Where the day's supply of milk feeds is prepared in the morning the upright must be used. Bottles should be very carefully cleaned after use first with cold water then with hot water and soda left to drain and scalded before filling again.

#### GENERAL HEALTH RULES FOR THE BABY

**Sleep.** A new born baby should sleep all day and night except when it is feeding and being bathed. By about 6 months 10 hours of the day should be spent in sleep a little exercise in the form of kicking filling in its waking hours. Sleeplessness is usually caused by some discomfort such as a wet napkin or tight clothing.

**Motions.** From a short time after birth the baby should be held over a commode at the same time every day. The best times are on waking and before or after every feed.

**Bath.** The baby should have a daily

bath in water at about blood heat preferably in a receptacle made of some soft waterproof material. No draughts and warm towels to wrap the baby in are important points to remember. A very gradual training for the cold bath habit is often advocated for the healthy normal baby starting with a cool sponge after the warm bath at 6 months to the actual cold bath between 18 months and 2 years. It should be followed by exercise.

#### DEVELOPMENT OF BABY

**The head** which is at first abnormally large compared to the body grows slowly after birth. If the soft triangular shaped spot above the forehead has not closed up by 2 years rickets may be present.

**Teeth.** About 7 should have come through at the end of the 1st year and 20 at the end of the 2nd. If they do not appear at this rate the feeding is probably at fault containing insufficient Vitamin D and lime salts.

*Standing and Walking* At a year old a baby should be able to stand with some help, and at the end of 15 months be able to walk

*Talking* A child should be able to say short simple sentences at the age of 2 years

*Bad Habits* *Bed-wetting* may continue until a child is 3 years old, unless care is taken to break the habit. More harm than good will be done by scolding, for it is generally the result of highly strung nerves or, in a boy, of a tight foreskin, in which case circumcision may be necessary. It can frequently be prevented by putting the child regularly on the commode about 10 p.m., and when it is old enough to take solid food, by omitting any drink from the last meal before it goes to bed.

*Thumb-sucking* is often caused by the use of a dummy in babyhood. The infant gets used to the idea of being comforted by the sucking, and when the dummy is taken away, sucks anything available, such as thumbs, fingers, clothes. It is best to avoid the use of dummies altogether, and so to prevent the habit from forming, but when it has once gained ground it is generally necessary to take drastic measures. Circular cuffs made from corrugated cardboard and stretching from the wrist to a little above the elbow prevent the child from putting its hand up, and it gradually loses the desire to suck. The wearing of cotton gloves will also often break the habit.

#### MINOR AILMENTS OF BABYHOOD

*Sore Buttocks* Napkins not changed sufficiently often, acid motion, or careless drying after bathing may cause this. A little simple ointment may be applied to the sore parts and covered with a pad of cotton-wool. Less sugar in the daily feeds may remove the cause of the trouble.

*Diarrhoea* Green, watery, and foul-smelling motions passed 5 or 6 times during the day means that through wrong feeding, a chill, or some microbe, the baby has diarrhoea. It is best when possible to call in the

doctor, but temporarily, boiled water may be given instead of the milk feed, and about 1 teaspoonful of castor oil.

*Colds* Little can be done beyond cleaning the nostrils with cotton-wool dipped in a solution of salt and water (about 1 teaspoonful to 1 pint of boiled water), especially before feeds. Much, however, may be done to prevent them. Soft foods which require no chewing, a warm stuffy atmosphere, and the presence of adults with colds should be avoided.

*Colic* may be caused by diarrhoea, constipation, over-feeding, the giving of food at the wrong temperature, or a binder which is too tight. Temporary relief may be obtained by holding the baby with its head on the left shoulder and slightly massaging the left side. Warmth (but not too great heat) may be applied to the abdomen, and a little gentle massaging with warm oil. A doctor may advise an enema.

*Convulsions* may be recognised by squinting, rolling of the eyes, twitching, a general blue colour, etc. Warmth applied to the body and cold to the head either in the cot or in a bath will generally relieve the attack temporarily, but castor-oil should be given after and the feeding altered. It is often due to too much food.

*Eczema and Scurf* A baby who is properly fed and lives in healthy conditions is unlikely to develop eczema, except perhaps at teething time. Olive-oil should be applied to the affected parts and the baby prevented from scratching. White vaseline is usually rubbed into the hair when it becomes scurfy and removed with liquid paraffin.

*Teething* Little can be done for the baby during teething time. A bone or something hard to chew will relieve the gums and help the teeth to come through.

*Infectious Diseases* A baby who is breast-fed and lives under healthy conditions should remain free from infectious diseases. Should there be an epidemic in the district, however,

Disease	Symptoms	Incubation period (day)
Chicken pox	Little red spots on face, developing into red spots and spreading to front and back of body	12-20
Diphtheria	Sore throat with white spots. Fever Vomiting Swollen glands in gland of jaw Headache	2-10
German measles	Headache Cold in the head. Rash beginning on face	16-21
Mumps	Swelling of gland below ear and behind jaw Fever Vomiting	9-12
Ringworm	Scurfy and scaly condition of scalp. Irregular patches with some redness	—
Scarlet fever	Vomiting Headache. Shivering Fever Sore throat	1-7
Smallpox	Shivering Pain in back. Vomiting Thirst Headache	12
Whooping cough	Cold and cough, which becomes hoarse and dry and hacking frequently followed by vomiting After week or 10 days cough becomes whoop	1-14

it is advisable to watch for any of the special symptoms of the current disease. The incubation period elapses between the baby's coming into contact with an infected person and the appearance of the symptoms.

**BIBLIOGRAPHY** Sir Truby King *Feeding and Care of Baby* The Expectant Mother and Baby's First Month Mabel Liddiard *Mothercraft Manual*

**Babylon** the metropolis of an Asiatic empire of antiquity situated on the E. bank of the Euphrates some 70 m. S. of modern Baghdad. Only vestiges of its ancient splendour remain. Babylon is the hellenized form of the Semitic name Babel, the meaning of which is the gate of god. The city owed its early importance to its association with the religious cult of the Sumerians. The priests of Bel mentioned in the Old Testament were the guardians of the mysteries to which the city owed its pre-eminence in W. Asia. Babylon was a great and powerful city from c. 2000 B.C. to 689 B.C. when it was almost destroyed by the Assyrian Sennacherib. In 539 B.C. Babylon fell to the Persian Cyrus and 200 years later to Alexander the Great. Under the Seleucids the heirs of Alexander the Great's conquests in W. Asia the city declined rapidly. Most of the inhabitants were

deported to the new city of Seleucia about the beginning of the 3rd cent. B.C. Babylon is famous alike in Greek and Hebrew literature for its size, opulence and vice. The Hanging Gardens of Semiramis were one of the Seven Wonders of the ancient world. Modern archaeology has however cast doubts upon Babylon's magnitude.

**Babylonia** the district of the Euphrates valley centred about Babylon situated S. of Assyria. Babylonian civilisation developed under Semitic influence on a Sumerian



Babyl Ishtar Gate and Processional Road to Nebuchadnezzar's Throne.

foundation The Chaldeans supplanted the native dynasties c 1000 B.C. Subsequently the Assyrians (q.v.) overthrew the Chaldean kings in the 7th cent. B.C. (For later history see PERSIA.)

The discovery of the Code of Hammurabi (King of Babylon, c. 2250 B.C.) has shed much light on the legal, economic, and moral characteristics of this early civilisation, and shows the existence of a highly developed society.

**Babylonian Captivity:** (1) The captivity of the Jews at Babylon, where they were carried by Nebuchadnezzar 597 B.C., returning in 537 B.C. after the Persian conquest of Babylonia. (2) The period A.D. 1309-1377, during which the seat of the Papacy was moved to Avignon by Philip IV of France.

**Babylonian Religion** Both the Babylonian and Assyrian religions show two distinct phases, local deities giving place to an established Pantheon with the god Marduk, the old local deity of Babylon, as head, as Babylon increased its political sway. Later, with the rise of Assyria, Assur became the chief god. Lesser gods were absorbed except for two triads, representing heaven, earth, and sea, and sun, moon, and life. The second period showed advance in ethics, gods and goddesses being endowed with virtues, and duties, ethical and ritual, being imposed on man. Marduk became merciful and loving. The heavens ordered events on earth and astrologers divined them, dissociating the gods from earthly powers. This religion influenced considerably that of the Hebrews, aided the development of theism, and purified to some extent the older notions of deity wherein the gods were clothed rather with vices than with virtues. The belief in astrology exercised a profound influence on the religions of Babylonia and Assyria.

**Baccarat** [*pron* BAK-A-RÄH'], a card game of pure chance, suitable only for gambling. *Baccarat banque*, or *à deux tableaux*, may be played by any number between 3 and 11. The

"bank" is put up to auction and taken by the highest bidder. Three packs of 52 cards are used, shuffles and dealt as one. The remaining players sit on either side of the banker 1 to 5 on each side. Each player stakes in turn, backing either side of the table against the bank. Bets may be made on both sides by putting stakes on a line drawn down the middle of the table, (*à cheval*). Any player has the right to go *banco*, i.e. challenge bank to its entire capital or the result of one hand.

**Dealing** The banker deals one card to the player on his right, one to the player on his left, and one to himself then 3 more cards in the same order. The object is to secure cards as near as possible to 8 or 9 by value of pip court cards and tens counting nothing. When 6 cards have been dealt they are examined; any player holding 8 or 9 must announce it at once, and the other 2 hands are exposed. If either player holds more than the bank, that side wins, and all bets on that side are paid by the bank, and *vice versa*. If no player can announce 8 or 9, the banker offers a card to the player on his right, if he refuses, to the player on his left, if both refuse, the banker must take the card himself. If the first player accepts the card, the left hand player may ask for one as well. When a card is taken it is turned face up. The banker pays the side nearer 9 than himself, and *vice versa*.

**Baccarat chemin de fer** In this variation 6 packs are used, and each player takes the bank in turn, holding it till he loses.

**Bacchanalia**, Roman festivals held in honour of Bacchus (q.v., Greek Dionysus). They acquired an evil name in part because of the debauchery that accompanied them, and in part because they were convenient for the planning of conspiracy. The Senate prohibited them in 186 B.C.

**Bacchus** (Gr. myth), or **Dionysus** god of wine, son of Semele and Zeus, from whose thigh he was born. His legend is complicated, but he has

en identified with the Osiris of the Egyptians who was reported to have conquered the East and was received everywhere as a god. The festivals in his honour the *Bacchanalia* or *Dionysia* developed into orgies. He was attended by Pan and Silenus and the ivy vine panther and magpie are sacred to him.

**Bach** [*pron* BAH GH] **Johann Sebastian** (1685-1750) one of the greatest composers in history—the father of modern music. Left an orphan at the age of 10 he had by that time already had violin lessons from his father. His brother Johann Christoph with whom he lived after his parents' death taught him the clavichord. The intense interest in everything musical that he displayed at this time combined with the beauty of his fine treble voice caused him to be appointed as chorister at St. Michael's Lüneburg in 1700 when he was 15 and in 1703 he was given the post of organist at Arnstadt. It was while he was at Arnstadt that Bach journeyed to Lübeck to hear the organist Buxtehude play. His next appointment in 1707 the year of his first marriage was to Mülhausen as organist at the church of St. Blasius. He went to Weimar as Court organist in 1708 where he remained until 1717 when he was appointed Kapellmeister to Prince Leopold of Anhalt-Cöthen. During his 9 years' service with Prince Leopold his wife died but he married again in 1721. In 1723 came the most important appointment of his career for that year he went to Leipzig as organist at the Thomaskirche where he composed all his greatest devotional music. Besides being organist and director at the Thomaskirche he was cantor at the Thomasschule and organist at the Nikolaikirche. He remained at Leipzig for 29 years during which time he produced a prodigious amount of music including the wonderful St. Matthew and St. John Passions and the B minor Mass. While still at Leipzig in 1747 he visited the Court of Frederick II at Berlin

where he performed many feats of extemporisation on the royal musical instruments and composed a fugue on a theme set by the King himself. Bach's enormous capacity for work inevitably affected his eyes and in 1749 he became totally blind dying the following year at Leipzig.

Bach's works not only comprise the most important individual contribution to the development of modern music but are intrinsically of the greatest beauty. He composed an enormous number of sacred and secular cantatas several masses eight beautiful motets two oratorios (including the lovely *Christmas Oration*) the *St. Matthew* and *St. John* Passions instrumental suites and concertos a vast quantity of superb organ music and many compositions for clavier including the two famous volumes of 48 Preludes and Fugues for *The Well-tempered Clavier*.



J. S. Bach.

Of Bach's two large families several members reached a relative prominence in the musical world the best known being Karl Philipp Emanuel Bach (1714-1788) his third son who was an eminent musician of his time and is largely responsible for the establishment of the sonata form.

**Bacillus**, see BACTERIOLOGY

**Backgammon**, a game for 2 players played with draughtsmen on a special board the moves being decided by throw of dice.

The game is said to have been invented about the 10th cent. A.D. the origin of the name is uncertain. In France the game is known as *le tric-trac*.

The board is divided into 4 tables each marked with 6 points of different



colours, the inner and outer tables being separated by a projecting *bar*, the pieces, 15 white and 15 black, are arranged as shown in the diagram. Two dice boxes and a pair of dice are used. *White* moves from black's inner table to black's outer, thence to white's outer, and finally to white's inner, *black* moving in the contrary direction.

Any man may be moved the number of points corresponding to the throw, unless the point to which it would move is blocked by 2 or more of opponents' pieces already on it. The whole throw may be taken with one man, or two men may be moved according to the number on each die. If "doublets" (e.g. two sixes) are

move must be made, and a move may be taken at any time instead of "bearing". The first player to remove all his pieces wins the game, a *single game* or *hit* if his opponent has begun "bearing", a *double game* or *gammon* if his opponent has not "borne" a piece, and *triple game* or *backgammon* if opponent, not having "borne," has a piece on winner's table or on the bar.

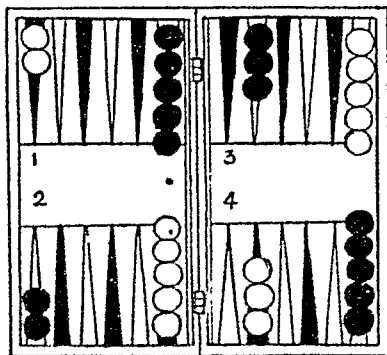
To play backgammon successfully requires knowledge of the chances of the possible combinations of a pair of dice.

In *Russian Backgammon* the pieces are not *set*, but entered on the tables according to the throw of the dice, and both players move in the same direction.

**Backhaus, Wilhelm** (b 1884), German pianist. Born at Leipzig, he was taught for a short time by D'Albert. Made early and highly successful appearances as a virtuoso, and first appeared in London in 1901. Is one of the most respected and gifted of present-day pianists. He was appointed in 1904 to the Royal College of Music, Manchester, as Professor of Piano.

**Backwardation**, *see* STOCK EXCHANGE.

**Bacon**, the salted, pickled flesh of a pig. The pig is made to fast for 24 hours before slaughter to cleanse it internally, while given access to plenty of clean water. The animal is slaughtered in such a manner that it is not excited or heated or in any way bruised beforehand, as any of these conditions may make the flesh difficult to cure and render the resulting bacon less palatable. Where only a few pigs are kept, it is best to kill in the colder weather to avoid loss through fire and certain other complications. The carcass is scalded a few minutes after slaughter in water 3 parts boiling and 1 cold. A part is scalded at a time, and the hair immediately scraped from it with the back of an old knife. Another method for removing the hair and bristles is to singe the body. The carcass is washed in cold water and opened, and the intestines, stomach, and gullet taken out, and the inside



Backgammon Board

thrown, 4 moves may be made. One piece left alone on a point is called a *blot*, and may be taken up ("hit") by the opponent moving a piece on to that point. A piece so "hit" is placed on the bar, and has to begin again by entering the opponent's home table, when a throw corresponds to an unblocked point. No other piece may be moved until this has been done. When either player has moved all his pieces into his own inner table or *home*, he begins to *bear*, i.e. remove his pieces from the board, one piece being taken from any point corresponding to the number of a throw. If the point is unoccupied a

and outside of the body washed. A stick is inserted to keep the ribs apart and the carcass left 24 hours to get cold then cut up and immersed in a pickling solution of salt saltpetre and cane sugar and injected with the same solution. It is then placed on a stone sprinkled with saltpetre and covered with a thick layer of salt. The hams and bacon are hung 3 or 4 weeks in a warm place to dry completely and then smoked in a smoke room or in a bottomless barrel having a bar across the top from which the bacon can be hung placed on a floor of bricks with smouldering sawdust. Smoking in this way requires 2-3 days. The bacon is stored in bags of calico till wanted for use.

**Bacon, Francis Baron Verulam Viscount St. Albans (1561-1626)** philosopher statesman and essayist son of Sir Nicholas Bacon was born at York House in the Strand. After studying



Francis Bacon.

at Trinity College Cambridge and Gray's Inn he was admitted an outer barrister in 1589 and became a Member of Parliament two years later. His reputation as adviser to the Earl of Essex favourite of Elizabeth was enhanced by the publication of his *Essays* in 1597. In spite of his friendship

with Essex he took a large part in his prosecution in 1600 for his actions in Ireland and again in 1601 for his leadership of the rebellion of London for which he was executed. Public opinion was so much roused by this last event that Bacon wrote a defence and an explanation of his actions.

The accession of James I in 1603 and the patronage of his favourite Villiers gave Bacon a chance of realising his hopes for power. His appointment as Solicitor (1607) Treasurer of Gray's Inn (1608) Attorney General (1613) Lord Keeper of the Great Seal (1616-17) and Lord Chancellor as Baron Verulam (1617-18) followed. In 1620 his greatest work the *Novum Organum* appeared and in Jan 1621 he was made Viscount St. Albans. This accession to greatness made him many enemies who soon seized the opportunity to bring about his downfall. He was accused of bribery and corruption in law suits the charges were substantiated and he was sentenced to a fine of £40 000 (which was remitted) imprisonment in the Tower (which he underwent for 4 days) and banishment from Parliament and Court (which was partly upheld).

His literary works are distinguished by their short antithetical style and sound practical substance and are full of learning expressed with great exactness. This love of exactness is notable also in his philosophical and scientific works which mark a new period in the history of scientific method. He laid great stress on the importance of the inductive or experimental as opposed to the medieval scholastic or deductive method and in him the Renaissance reached complete fruition.

His profound knowledge and literary skill form part of the basis of the assertion of some that he was the author of the works of Shakespeare Greene Peele Marlowe and Spenser though they also profess to prove this claim by means of cypher writings concealed in these works. Another hallucination is that Bacon and Essex

were children of Elizabeth and Leicester Suffice it to say that Bacon's acknowledged books amply represent one man's life-work, and fully justify his reputation as one of England's greatest thinkers and writers

Bacon, Roger (c 1214-1294), philosopher and scientist, "Doctor Admirabilis," entered the Franciscan order, but his chemical studies were mistaken for magic, his scientific works were banned as heretical, and he was imprisoned for long periods His greatest work is the *Opus Majus*, in which he deals with every aspect of science and theology He is popularly supposed to be the inventor of gunpowder, which he is known to have made In spite of his great chemical knowledge, so highly advanced for his times, he believed in the possibility of alchemy and the existence of the philosopher's stone

**Bacteriology** is the science concerned primarily with the study of bacteria, microscopic organisms, many of which are barely visible under the most powerful microscope

The first record of the existence of these minute organisms was made in 1675 by the Dutch lens-maker Leeuwenhoek, who saw them in dirty water, and later (1681) in saliva In 1683 he sent drawings of various bacteria to the Royal Society, London A suggestion was made that these organisms might be concerned with disease, but not until microscopes were improved was it possible to show with certainty the connection between bacteria and various diseases Until 1869, when Hoffman isolated them as a group, the bacteria were included with yeasts and other microscopic organisms Since that time various attempts, based mainly on the external forms and the mode of movement of the bacteria, have been made to classify them, but have proved unsatisfactory

The nomenclature of the classifications based on form persists in so many of the pathogenic bacteria that the considerations leading to these classifications deserve mention

*Bacilli* are narrow cylindrical forms appearing rod-like at first sight The lengths of species of bacilli vary considerably The motile forms are provided either with a flagellum at each end or at one end, or with a number of flagella all round the bacillus An investment called a capsule is often present

Spherical cells are named *Cocci* When they divide transversely and remain in contact they form a chain Bacteria developing in this way are *Streptococci*, and are very active in pus formation One species causes erysipelas

*Cocci*, dividing in different directions, form a group resembling in shape a bunch of grapes, this formation distinguishes the *Staphylococcus* Species of this group are always present in the nostrils and mouth, and are found in greater numbers during a common cold

The *Spirilla* consists of one or more comma-shaped, spirally curved, or undulating bacteria remaining in contact end to end According to the mode of attachment, spirilla forms may be wavy or spiral Some species are flagellate, having from 1 to 20 flagella either at one end, or at both ends The best-known comma bacterium is that causing cholera, sometimes called the cholera vibrio

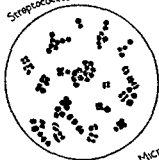
*Spirochata* are long spiral or undulating motile forms, usually very thin They perform various movements by contraction, and include organisms causing such highly infective diseases as syphilis and yellow fever

All these forms collectively were termed *Lower Bacteria* The *Higher Bacteria* included branching forms, and the lower fungi

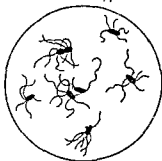
The system of classification now generally accepted was introduced by the Society of American Bacteriologists, and includes, under the class *Schizomycetes*, those forms of fungi and of *Myxomycetes*, sometimes called the slime fungi, which are so closely allied to the bacteria that it seemed more fitting to include them in the

## BACTERIOLOGY

Streptococcus



Bacterium Typhi



Micrococci Schematic



Sarcina Pulmonum

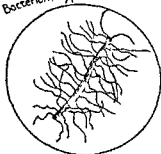


Vibrio Cholerae



Bacterium Typhi

Spirilla from Nasal Mucus



classification shown in the table below

mentous forms generally invested in a glutinous sheath which, in the "iron

### SCHIZOMYCETES

1 Eubacteriales	2 Spirochætales	3 Chlamydo-bacteriales	4 Thio-bacteriales.	5 Actino-mycetales.	6 Myxo-bacteriales
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The distinguishing characteristics of Schizomycetes are microscopic organisms consisting each of a single cylindrical, spherical, spiral, or comma-shaped cell which may divide either transversely, or longitudinally, or both, or even in three planes. The new individuals resulting from the division may remain in contact, and are in some species surrounded by a common sheath. Some organisms move by undulation, others are propelled by flagella, minute hair-like outgrowths capable of movement. Some species produce endospores, small resting structures formed within the organisms, able to resist unfavourable conditions such as drought and extreme temperatures, and, under favourable conditions, able to develop into active bacteria. Other members of the order produce conidia, spores formed by abstraction of part of the individuals, and each capable of development into a new organism.

The *Eubacteriales* are simple cylindrical, rounded, or spiral, undifferentiated forms, unable to bend. Although they may apparently form filaments by organisms remaining in contact, end to end, they never form a true filament, which consists of a single elongated organism often divided transversely into cells. Very few forms are branched. Some move by means of flagella. They reproduce by dividing transversely into two. Under certain conditions some Eubacteriales produce endospores.

The *Spirochætales* are generally spiral forms, slender and able to bend. They reproduce by dividing either transversely or longitudinally, and in many respects resemble the Protozoa (q.v.).

The *Chlamydo-bacteriales* are fila-

bacteria," is impregnated with iron oxide. In addition to reproduction by fission, the bacteria form minute conidia.

The *Thiobacteriales* vary in form, but the organisms contain either granules of sulphur or of the pigment bacteria-purpurin, or of both. This group includes the "sulphur bacteria." They reproduce by fission and in some forms by conidia.

The *Actinomycetales* include organisms resembling some of the lower fungi in their filamentous form, sometimes branching and producing a mycelium or web of filaments. They grow slowly, are incapable of movement, and some reproduce by conidia. Some are parasites.

The *Myxobacteriales* include organisms living in groups and able to move by an almost imperceptible creeping. Under unfavourable conditions the organisms encyst themselves, that is, they form a protective wall enclosing them until favourable conditions obtain.

**Structure** — The bacteria consist each of a unit of structure, a cell, formed of protoplasm which has a definite outline. The protoplasm may be surrounded by a transparent adhesive envelope, enabling the organisms to cohere in glutinous masses such as may be found on top of water in which flowers have been kept for some days. An envelope having a distinct boundary is described as a capsule, and the difficulty of satisfactorily treating certain forms of pneumonia is thought by some bacteriologists to be due to the protective nature of the capsules enclosing the bacteria concerned. These have been broken down by the activities of other bacteria grown in the same culture, and it may perhaps be possible

to use these or the products of their activity in the treatment of the disease. After the destruction of the capsule the bacterium is easily killed.

**Conditions of Life.** The results of the activity of bacteria are often enormously out of proportion to the size of these organisms and have helped to focus man's attention on the group. By growing them on special media and under carefully controlled conditions the bacteriologist investigates the conditions favourable and unfavourable to the life of the organisms.

In common with all other living creatures bacteria need food but the nature of the food required varies considerably. Some bacteria like green plants are capable of existing when supplied with air and inorganic salts. Other species need protein others carbohydrate yet others need blood and the *Bacillus influenzae* when grown in the laboratory must be supplied with hæmoglobin the red pigment of the blood. Food is absorbed in solution over the surface of the bacterium. Usually when food is scarce bacteria form endospores which may rest for very long periods until it is again available. Bacteria unable to form spores die when the food supply fails. Although water is essential to bacteria some of them can survive desiccation for years. Others like the cholera bacterium can be killed by a few hours of complete drought. Some bacteria resemble yeast and certain other fungi in their ability to live with or without oxygen. Other bacteria are obligate aerobes that is air is essential to them whereas others obligate anaerobes are unable to live in the presence of oxygen.

Bacteria may be killed by heat but the temperature necessary to cause death varies considerably. When milk is heated for 20 minutes at a temperature greater than 60°C but not exceeding 80°C, most of the bacteria causing tuberculosis and diphtheria are killed while the vitamins remain unchanged. Boiling the milk for only 2 or 3 minutes kills harmful bacteria

but the vitamins are destroyed. Endospores are killed with difficulty. Certain bacteria growing in dung flourish at temperatures ranging from 60 to 0°C others grow best when kept at 20–25°C while those found in the animal body are most active at about blood temperature. Although many bacteria grow best at a certain temperature (the optimum which differs for different species) others can be kept for some time at temperatures above and below their optimum.

Bacteria may also be killed by the direct action of sunlight and particularly by ultra violet rays but since these rays can penetrate only about a centimetre below the skin they do not affect organisms in deeper tissues of the body.

**Culture.** In the laboratory bacteria may be grown on various media and incubated at any required temperature. Since the organisms are omnipresent all the apparatus and the medium used in cultures must be thoroughly sterilised otherwise many different kinds of bacteria will appear in the culture and will probably interact with the bacterium to be examined and influence its growth.

The method of sterilisation is dependent on the types of bacteria to be eliminated. Some are best killed by dry heat and in such cases dishes and tubes are heated for 20 to 30 minutes in an oven at a temperature of 160–180°F. Needles and fine tubes used for transferring the bacteria to the medium are passed through the flame of a spirit lamp or of a Bunsen burner or may be dipped in alcohol. Surgical dressings may be sterilised by dry heat at a temperature not high enough to char them. At home sterilisation by steam may be carried out by putting articles in a colander or perforated tray in a large saucepan or fish kettle and steaming them for an hour and a half.

Bacteria may be removed from fluids by pouring them through tubular filters made of fine unglazed porcelain or earthenware made from the cell walls of diatoms (see) of fibre or to

remove the smallest organisms, through a membrane of collodion. These filters, however, permit the passage of ultra-microscopic particles, and the filtrates may contain filterable viruses, which will be discussed later.

Agar-agar, a material extracted from seaweeds found near China and Japan, when added in appropriate quantity to various nutrient solutions before sterilisation, causes them to set like a jelly, providing a very convenient medium, much more easily transported and handled than liquid media. For the same reason gelatine is often used, but since it melts at a lower temperature than agar, it is not of such general use. Some bacteria, however, will not grow on synthetic media, and must be cultured on animal tissues, in blood, or on other special media.

#### *Bacteriophage and Filterable Viruses*

On old cultures of bacteria sometimes glazed areas appear, and their increase accompanies a decrease in the size of the bacterial colonies, which may ultimately disappear, leaving only the glassy-looking areas. The material of these areas passes through the finest filters, and the filtrate, added to fresh colonies of bacteria, induces either their disappearance or their disintegration. It is not certain whether this phenomenon is due to an ultra-microscopic organism parasitic on bacteria, the view taken by d'Herelle, who suggested the name bacteriophage for the virus, or whether chemical agents, free from organisms, cause the change. So far, it has been impossible to obtain bacteriophage except in the presence of living bacteria, which are essential either for its propagation, or its formation, according to the view adopted.

While in many diseases such as erysipelas, cholera, meningitis, and pneumonia, various bacteria are known to be the causal organisms, no bacteria have been found in such infective diseases as smallpox, measles, mumps, chicken-pox, and foot and mouth disease. In all these diseases, the fluid passing from infective blood

through the finest filters is capable of transmitting the disease. The filtered serum therefore contains an active principle or virus which is finer than the pores in the finest filter. The bacteriophage provides a special example of a filterable virus attacking bacteria. Until much more powerful microscopes than any at present in existence have been made, it is impossible to say whether this filterable virus contains minute virulent organisms, or minute quantities of chemical compounds able to cause specific diseases. Since filterable viruses seem to be able to increase in animal tissues, it seems more probable that ultra-microscopic organisms are present, and this view is supported by the fact that the filterable virus causing pleuro-pneumonia has been cultured and sub-cultured several times in the laboratory. Material from the subcultures, introduced into animals, produced the disease in as virulent a form as the original virus.

*Toxins and Anti-toxins* Many bacteria are able to secrete substances producing changes in their substratum. This is easily recognised in the case of bacteria feeding on cellulose (*qv*), a substance resisting ordinary solvents, but dissolved by the bacterial secretions which probably contain enzymes (*qv*).

Within the human body the bacterium causing diphtheria produces a highly poisonous substance, called a toxin, which can be separated from the organism by filtration. Whether this toxin is a secretion helping the bacterium to obtain the food it needs, or whether it is a waste material manufactured and excreted by the bacterium, has not yet been ascertained. Even less than one five-hundredth of a cubic centimetre of the toxin, injected into a guinea-pig, may kill the animal in less than a week, and in diphtheria it is not the actual bacteria, but the toxins they produce, that make this disease so dangerous. The tetanus bacterium also produces highly poisonous toxins, less than a thousandth of a

milligramme often sufficing to kill a guinea pig

In contrast to these toxins sometimes distinguished as exotoxins because they are found outside the bacterial cells endotoxins are formed by the bacilli causing anthrax typhoid fever cholera, dysentery tuberculosis and other diseases. These endotoxins are liberated when the organisms are killed by heat or when they disintegrate naturally. When such disintegration occurs within the animal body the endotoxins may have harmful effects upon the tissues. The endotoxins of the tubercle bacillus for example cause the tissues to form small tubercles round the dead bacteria.

Very little is known of the constitution and mode of action of the toxins but it has been found possible to neutralise their harmful effects by the introduction of the antitoxins formed by animals when small quantities of toxins are introduced into their bodies. The antitoxin is capable of combination with a definite amount of toxin so forming a harmless compound. The process is comparable to the neutralisation of an acid by a definite amount of alkali.

**Immunity** When small quantities of the toxins of diphtheria are injected just below the skin or into the muscles of a horse antitoxin is manufactured and found in the serum. As the injections of toxins are increased the production of antitoxin rises to a maximum and such serum can be used in the treatment of diphtheria. It may also be used to give artificial immunity against the disease. The antitoxic serum is tested with toxins of known strength and in this way the amount required to neutralise the toxin can be accurately estimated.

This is the general method of preparation of antitoxic sera and the immunity gained by their transfusion into animals is described as *passive immunity*. The animal producing the antitoxin gains *active immunity*.

Antitoxic sera are used to cure and to

prevent diphtheria tetanus botulism snake bite and scorpion sting. As preventives they are efficacious for only a short time for their chemical constitution gradually changes and they lose their power of neutralising toxins.

**Vaccination** Injections of attenuated bacteria or of their products cause a mild form of disease and stimulate the production of antibodies which are produced slowly and may remain in the blood for some time. Vaccination and preventive inoculation depend for their success on the production of these antibodies. The bacteria causing smallpox are similar to those causing cowpox but the latter are less virulent in man and by transferring them from calf to calf they eventually lose much of the virulence and produce only mild attacks of cowpox. The decrease in virulence is partly due to the fact that with very transference some of the antigens the products of bacterial activity and of the antibodies tending to neutralise their action are introduced with the bacteria. The attenuated organisms are then cultured in calf lymph and introduced under the skin of a human being. The production of antibodies begins and continues for some time until the bacteria can no longer withstand them and disintegrate. The antibodies may give immunity for fourteen or fifteen years. Preventive inoculation against cholera tuberculosis typhoid fever and other diseases depends on similar principles. Vaccines need not contain even attenuated bacteria provided that sufficient antigens to promote the production of antibodies are present.

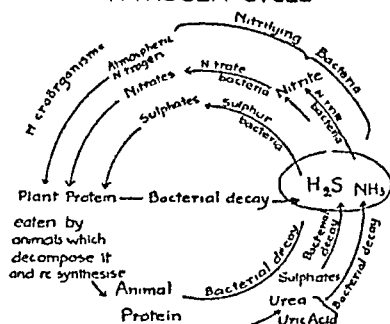
**Uses of Bacteria** While there are many forms of bacteria causing disease in man and other animals there are also a great number of useful bacteria. Many chemical processes are dependent upon or are accelerated by bacterial fermentation. Citric acid may be produced by bacterial fermentation of lemon juice vinegar by the fermentation of alcohol and lactic acid from milk. When the leaves of the indigo



plant are bruised in water, bacteria act upon the cell contents and precipitate the indigo. The flavour of tobacco is enhanced by bacterial action, when the leaves are spread out and left to dry slowly. Sauerkraut also is produced by fermentation.

The activities of bacteria are utilised in the retting of hemp and linen. By fermentation the plant cells are disintegrated and the fibres more easily separated. In the dairy, bacteria help to prepare the cream, before churning, for its change into butter. Others, given the opportunity, produce butyric acid in the butter, and make its flavour unpleasantly rancid. Still other bac-

### NITROGEN CYCLE



teria ferment the casein in cream, and are essential to cheese-making.

In agriculture, bacteria are equally useful. Every day, plants (*qv*) are removing nitrates from the soil, and it would seem as if the soil should have been depleted of nitrates thousands of years ago. The fact that it is not is due to the presence of nitrifying bacteria able to use free nitrogen and build it first into ammonium compounds, then into nitrites, and finally into nitrates used by plants. Some of these nitrifying bacteria live in the roots of leguminous plants. Apparently then the supply of nitrate is maintained at the expense of free atmospheric nitrogen, and the supply of that gas should steadily be diminishing. This supply, however, is main-

tained by other organisms, the denitrifying bacteria, which act on the proteins in decaying leaves, and other vegetable and animal refuse. The proteins are first broken down into ammonium compounds. Some of these are synthesised by nitrifying bacteria, and some are broken down still further with the liberation of free nitrogen. Thus the two kinds of bacteria cause a complete cycle of changes, as shown in the diagram, from nitrogen to nitrates, which the plants build into proteins decomposed with the liberation of nitrogen.

Bacteria are invaluable in the decomposition of sewage. Although this is treated in different ways by various local authorities, it is probable that similar changes due to bacterial action take place. In one stage of the treatment there is free access of air to the sewage and changes are accomplished by aerobes. The ammonia and carbon dioxide formed combine to produce ammonium carbonate. In another stage the air supply is very limited and anaerobes are probably responsible for the complex changes occurring during this stage. Proteins and cellulose are decomposed, and the protein nitrogen converted mainly into ammonium compounds which are partly transformed into nitrates by nitrifying bacteria, and partly broken down by denitrifying bacteria with the liberation of nitrogen. These useful bacteria thus destroy the food materials which might be used by harmful bacteria contained in the excreta, but such organisms remain a source of infection for some time after the changes described have taken place. This is the reason for preventing the contamination of drinking water by sewage even after putrefaction has ceased.

**Bacteriological Investigation.** Very many hospitals have their own bacteriological department, where specimens of sputum, blood, and tissues of diseased patients can be prepared for microscopic examination. Knowledge of the form and habits of the bacteria



FLEMISH ART EDWARD VI AS A CHILD  
By Holbein (Earl / Y. enough Collection)



ART: GREEK SCULPTURE. THE VICTORY OF SAMOTHRACE  
(The Louvre, Paris)

concerned in conjunction with the symptoms of the disease facilitates correct diagnosis. At the Lister Institute Chelsea London vaccines and sera are prepared and distributed. Various bacteria are kept in culture and may be obtained by scientific workers. Agricultural stations also have a department dealing with the bacteriology and protozoology of soil. Farmers having diseased cattle might be well advised to send specimens of soil requiring analysis to these stations for as Pasteur demonstrated bacteria causing anthrax for example rest on the soil and infect cattle a year or more after the first outbreak of the disease. The bacteria causing tetanus are found in well manured soil.

Owing to the work of the bacteriologist both directly and indirectly in the improvement of sanitation leprosy plague dysentery and cholera are being reduced. Among the most pressing problems for the bacteriologist or perhaps for the chemist is that of the prevention of foot and mouth disease which is due to a particularly virulent filterable virus responsible for very considerable losses amongst cattle. The disease is highly infective. It may be transmitted to human beings but seems to be much less virulent in man.

Research on this disease on influenza and on cancer is still in progress and there is reason to hope that the last named disease may be successfully combated in the near future. See also BIOCHEMISTRY FUNGI MALARIA PROTOZOA

Further information may be gained from the *Manual of Bacteriology* by Muir and Ritchie and from various biological and medical journals.

**Bactria** the name formerly given to the district between the Oxus and the Hindu Kush now part of Afghanistan. The chief city was Balkh (q.v.). The Iranian tribes who inhabited it were organised in petty kingdoms not unlike those of England under the Heptarchy. Cyrus the founder of the Persian Empire conquered Bactria and formed it into a satrapy. The

satraps of Bactria aimed at local independence and Bessus a satrap murdered Alexander the Great's opponent Darius III.

The Macedonian conquest of Bactria which placed it under Greek influence was followed by the brilliant period in its history. Under the Seleucids Greek coinage and language were in general use and many Greek cities were founded. Bactria became the principal channel through which Greek culture influenced Indian art. A Greco-Bactrian kingdom arose out of the Seleucid empire which after a brief period of power fell before the Scythian (Mongol) invaders (139 B.C.). Later incursions by the White Huns and Turks further weakened Greek influence and in the 6th cent. A.D. the region fell under the sway of the Mohammedan Arabs. The district to-day preserves little of its ancient splendour.

**Badajoz** [BADAJOZ] (1) A province of Spain on the Portuguese frontier. The surface is mountainous and infertile. The R. Guadiana flows through the N. districts. Agriculture does not thrive and trade is hampered by poor communications. Sheep cattle pigs and horses are reared in large numbers. Local textiles wine leather and soap manufactures employ a number of the inhabitants and there is a busy transit trade with Portugal. Area 8450 sq. m. pop. (1931) 705 700 (\*). The capital of the above on the Guadiana. The city has a 13th-cent. cathedral and the ruins of a Moorish castle. Badajoz the capital of a Moorish kingdom in the 11th cent. came under Spanish rule in 1492. Pop. (1931) 44 300.

**Badajoz, Siege of** (March 17–April 6 1811) the British under Wellington captured the fortress from a garrison of French Hessians and Spaniards. The most bloody of all the struggles in the Peninsular War. The fort had been twice previously unsuccessfully besieged by Wellington in 1811.

**Baden** A Republic of the

war German Reich, situated in the S W., having the Rhine on the W and Lake Constance on the S E. It is bounded by Württemberg on the E, Bavaria and Hesse on the N, the Bavarian palatinate and France on the W bank of the Rhine, and Switzerland on the S Area, 5820 sq m

Agriculture, forestry, and stock-raising are the main occupations. Manufactures are diverse, and include wine, clocks, woodwork, leather, musical instruments, cigars, chemicals, silks and cottons, potash and salt are mined. Building stone is quarried to a considerable extent. The forests cover over 1½ million acres.

The inhabitants are almost entirely German-speaking, the Roman Catholics predominate, Protestants forming about 40 per cent of the population. There are also some 20,000 Jews. The chief towns are, according to the figures for 1925, Mannheim (247,500), Karlsruhe (145,700), Freiburg (90,500),

Pforzheim (78,900), and Heidelberg (73,000). Of these, Heidelberg and Freiburg have universities. Pop (1925) 2,312,460.

Most of the Republic consists of the high mountains of the Black Forest; the highest summit is the Feldberg, 4900 ft. Baden is noted for its numerous medicinal springs. The N is lowland and also the basins of the Rhine, and its E tributaries, as well as of the Neckar. The Republic also includes the source of the Danube, which has its rise in several Black Forest streams on the E watershed.

*History.* Baden originated as a province of the Empire. In the 12th cent it came into the possession of the powerful Zähringen family, who raised the county to the status of a margravate. In the 18th cent Baden had become divided among various branches of the ruling family, but was reunited under one ruler in 1771. Baden, by supporting Napoleon, secured large accessions of territory at the expense of its neighbours. In 1806 the Margrave proclaimed himself grand duke and an independent ruler. After 1815 Baden joined the German Confederation, and in 1832 the Grand Duchy was included in the Prussian Zollverein or Customs Union. The Grand Duchy later entered the German Empire. On Nov 22, 1918, the Grand Duke abdicated, and Baden was proclaimed a republic.

Baden-Baden, town and spa in the Republic of Baden. In the 19th and early 20th cents it was a very fashionable continental resort and a famous gaming centre, frequently visited by King Edward VII. Since the War its popularity has declined. The town was founded by the Romans, who were evidently attracted by its medicinal springs. Pop (1925) 25,690.

Baden-Powell, Robert Stephenson Smyth, Baron (b 1857), founder of the Boy Scouts. Military service included Ashanti 1895, and Matabele campaign 1896-7. His defence of Mafeking in the Boer War gained him great fame, and its relief in 1900, after



Lord Baden-Powell

a siege of 215 days was the occasion of much rejoicing and introduced a new word ( mafficking ) into the English language. He started the Boy Scout movement in 1908 and as Chief Scout he is now a world famous figure. Knighted in 1909 he was made a peer in 1929. He has written works on military subjects Scouting and Girl Guiding.

**Badge** in heraldry a device distinct from a crest and capable of being borne without any accessory. Badges were depicted as a sign of ownership upon property worn by servants and retainers and represented on battle standards. A noteworthy example of a badge is the three ostrich feathers of the Prince of Wales with the motto *Ich dien* I serve.

**Badger** an animal of the weasel family but comparatively harmless. Omnivorous in diet it is particularly fond of the eggs of poultry and game birds. It is heavily built with short powerful legs and burrowing feet and has the head striped with white and the back grizzled. Badgers are found in Great Britain and extend through Europe and Central Asia to Japan. They were formerly eaten in this country and were used for the sport of badger baiting now prohibited. The hair is used for making shaving brushes. Another name for the badger is Brock from which come such place names as Brockenhurst and Brockley.

**Badminton**, a game for 2 or 4 players with racquets and shuttlecocks introduced to England from India about 1873. Its name comes from the Duke of Beaufort a Gloucestershire seat. Rules were compiled at Poona in 186 and 11 years later formed the basis for an English set drawn up by the Bath Badminton Club. These were adopted by the Badminton Association which was founded in 1893. The All England Championships (doubles) were first held in 1899 the first Singles Championships in 1900.

In England the game is usually played on a covered court (44 x 20 ft)

marked out as shown in the diagram and crossed by a net 30 in high by 17-4 ft long the top of the net being 5 ft above the ground at the centre 5 ft 1 in at the posts. The *shuttle* has 16 feathers 2½-2¾ in long and weighs 73-85 grains. The *racquet* has no regulation size or shape. It is strung with strong fine gut and weighs about 6 oz.

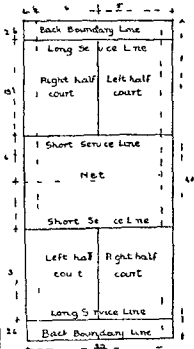


Diagram of Double Badminton Court.

Game consists usually of 15 points or aces. Three games constituting rubber but in one-game matches game is usually 1 aces and in women's singles 11 aces.

The game consists entirely of volleying (i.e. the shuttle ceases to be in play once it has touched the ground) and is very fast.

Choice of end or first service is de-

cided by tossing, ends are changed after each game, and in the 3rd game, when the leading side reaches 8 in a 15-ace game, or 6 and 11 respectively in an 11- or 21-ace game. If the score reaches 13 all in a 15-ace game, the side first scoring 5 aces wins, or after 14 all, 3 aces. This applies to a score of 9 or 10 all in an 11-, and of 19 or 20 all in a 21-ace game. The *server*, standing in his own right half-court (*see* diagram), strikes the shuttle diagonally over the net to the opponent, the "striker," standing in the opposite right half-court. If the "in" (serving) side makes a "fault" (*ie* serves the shuttle into the wrong court, strikes it out of court, or through or under the net, or allows it, when returned over the net, to touch the ground inside the court), the server loses the "hand" (*ie* right to serve), but no score results. The side serving first has only one "hand" at their first "innings," but subsequently after one fault by the "in" side the server's partner takes a "hand," and only after two faults does the service pass to the opposing side. If the "out" (non-serving) side makes a fault, the "in" side scores 1 ace, and the "hand" continues, with service from each court alternately, until the "in" side makes a fault. Aces can be scored by the "in" side only.

If from service the shuttle strikes the net, it is a "let," *ie* the stroke does not count, and service is taken again.

Service must be made from below the line of the waist, and with both feet inside the half-court. It is a "fault" if the shuttle touches the roof or side of the court, or the person of any player, or is struck before it has passed over the net, or is not distinctly struck but "spooned" over.

Baedeker, Karl (1801-1859), publisher and writer of guide-books to many of the countries in the world. They have been issued in German, English, and French. The publishing business founded by him is now at Leipzig.

Baffin, William (1581-1622), English

navigator and explorer. Nothing is known of his youth, history only recording the facts of the last 10 years of his life. In 1612 he sailed with an expedition under Captain James Hall in search of the N W Passage, and on the murder of Hall by Eskimos, served in the Spitzbergen whale-fisheries under the Muscovy Company. In 1615 he captained the *Discovery* in another N W Passage expedition, and charted Hudson's Bay, while in the following year, reaching 300 m beyond the previous limit of navigation, he discovered the bay which bears his name. In 1617-19 he sailed to Surat for the East India Company, exploring the Red Sea and the Persian Gulf *en route*, and in 1620 was killed during an attack on Kishm, in the Persian Gulf. He perfected many scientific principles of navigation, especially the determination of longitude by the moon.

Baffin Bay, arm of the Arctic Sea between N E Canada and Greenland, connecting, by Davis Strait, with the Atlantic, and by Smith Sound with the Arctic. The coasts are rugged and deeply indented. A centre of the whale fisheries, the Bay was first explored by William Baffin in 1616.

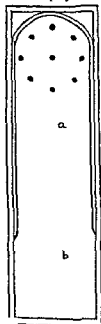
Baffin Land, Canadian island S W. of Baffin Bay, separated by a narrow strait from Melville Peninsula. It is sterile, rugged, and inhabited only by a few fishermen of the Eskimo race. Area, over 235,000 sq m.

Bagasse, crushed sugar-cane pulp after the juice has been expressed (*see* SUGAR). It is used as a thermal insulator for packing the walls of buildings, and also as a fuel. The material is known also as *megasse*.

Bagatelle (French, from Italian *bagatella*, a trifle), a game played with cues and balls on an oblong board, varying in size from 6 x 1½ ft to 10 x 3 ft, with a semicircular end, and cups numbered from 1 to 9 set in the bed of the board, which is made of slate or wood covered with green cloth. Nine balls are used, 1 black, 4 red, and 4 white, the black being placed on a spot about 9 in. from hole 1, and the

others struck in turn with a cue from a spot within a line drawn about 18 in from the players' end of the board (the *baulk*).

Any number of persons may play either separately or in sides. Each player strikes all 8 balls in turn the object being to send them into the holes but the black ball must be touched before the initial score can be made if the black is knocked into a hole it scores double. The game is decided on aggregate score in an agreed number of rounds. There are a number of variations on the ordinary game e.g. *Sans Egal* or French bagatelle in which there are 9 players one using the white balls and the other the red



Bagatelle Board.

The first player aims at the black for hitting a ball for a miss. When black is been touched each plays alternately with the object of holing the black and his own balls holing opponents ball scores for opponent. The game consists usually of 31 or 32 points.

The *Cannon Game* is the most scientific form of bagatelle. Three balls are used white spot white and black. Black is spotted as above and the non striker's ball placed midway between holes 1 and 9. The object is to make *cannons* i.e. touch both object balls with the striker's ball. Balls falling into holes also count but a cannon must be made with the same stroke or balls holed count against

the striker. A cannon counts 2 missing the object ball scores 1 to opponent. In the *Irish Cannon Game* all holed balls count against the striker.

*Mississippi* is played with a bridge of 9 or more arches numbered from 1 upwards. All 9 balls are generally used black being sometimes omitted. The object is to send each ball through one of the arches not directly but off the cushions. A ball sent directly through an arch scores against striker. Black if used counts double. Holed balls also score. In *Trou Madame* the ball need not hit the cushion before passing through arch and holed balls count against striker. In *Bell Bagatelle* an inclined board is fitted with cups arches with bells attached and numbered stalls. The ball is played from the side and rolls down the incline through arches or into cups or stalls. *Corinthian Bagatelle* is somewhat similar but the board is smaller and no arches are used. The balls are struck with a very short cue up an inclined groove at the side of the board.

Bagdad, capital of Iraq situated for the most part on the E. banks of the Tigris c. 340 m. from the Persian Gulf. Besides its administrative activities Bagdad is the centre of caravan traffic the terminus of the railway from Basra and an important air port and there is a motor service N. as well



Bagdad. G. far by the Tigris.

as motor services across the Syrian Desert to Syria and Palestine.

The principal exports are carpets, textiles, dates, tea and hides. Local



industries are leather, metal utensils, and silk manufactures. There has been a city on or near the present site from the earliest times. Bagdad was at its zenith under the Arabian rulers of the 9th cent., when it was associated with the almost legendary character of Harun al Rasid. It declined under the Saracens and was finally overthrown by the Mongol raid under Hulagu in the 13th cent. Under the influence of modern methods of transport Bagdad is regaining its former importance. Rapid progress is being made with the introduction of modern amenities. Bagdad is still in appearance Oriental, but modern methods of water supply have been introduced, hospitals have been erected, and a university opened.

Following a gallant failure in 1915 by Sir Charles Townsend during the World War, the city was occupied by the British under Sir Stanley Maude in 1917. Pop. c. 250,000.

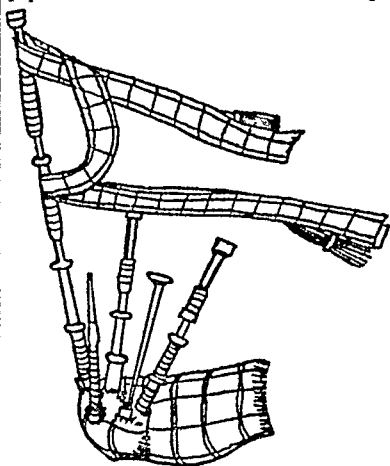
(2) Vilayet of the kingdom of Iraq, situated on the river plain of Mesopotamia in the vicinity of (1). It was a rich agricultural district in ancient times, but is now uncultivated owing to the disuse of irrigation. Dates are grown, and the vilayet has some useful minerals, petroleum, naphtha, bitumen, and coal. The principal industry is carpet weaving. Wool and mohair are produced. Pop. 1,360,500. Area, 54,520 sq. m.

**Bagdad Railway**, line projected late in the 19th cent. to link Berlin with Bagdad. It was an important aspect of Germany's policy of expansion. The section from Constantinople to Konia beyond the Taurus is complete, and links up with the Syrian railway system, but that constructed in Iraq is in poor condition, and motor transport is mainly used. Since the War the line has been under Turkish, French, and British control.

**Bagehot, Walter** (1826-1877), journalist and economist. He edited *The Economist* for some time, and was assistant editor of the *National Review*. His best-known works are *The English*

*Constitution*, *Lombard Street*, and *Physics and Politics*.

**Bagpipe**, a musical instrument dating back to ancient Greek days, and known throughout Europe in mediæval times. To-day it is still played in Scotland and Ireland, and in E. Europe. The instrument consists of a leather wind bag, which is filled with air, either by the player blowing into it through a tube, or in some cases by a bellows; a pipe called a *chanter* fitted with finger



Scottish Bagpipes

holes, on which the notes are played; and one, two, or three *drones*, or pipes with fixed pitch, which supply a droning accompaniment to the melody.

**Bagshot Beds**, see EOCENE SYSTEM.

**Baha'ism**, see BABIISM.

**Bahamas** (or *Lucayos*), group of islands in the W. Indies, between Florida and Santo Domingo, N. of Cuba. The rocks and islets are very numerous, but only 29 can be ranked as islands, some 20 of which are inhabited. The largest are Great Bahama, Great Abaco, Andros Islands, and Great Inagua. The capital of the archipelago is Nassau, but New Providence, a comparatively small island, is the most densely populated.

The archipelago is a coral formation. The principal exports are sponge and sisal tomatoes are increasingly cultivated. Timber and fruit (olives, oranges and lemons etc.) are abundant on the larger islands and there is an export of canned fruit. Turtle and pearl fisheries are of some local importance. The Bahamas are a Crown Colony.

The Bahamas are said to have been the first land sighted by Columbus in the New World (1492) they were not however settled by the Spaniards. During the 17th cent. an English self-governing colony of proprietors was established but was not a success. In 1717 the proprietors gave up the control of the government and defence to the Crown and the first royal Governor was appointed in 1718. Area 4000 sq. m. pop. (1930) 60,000 mostly negroes of slave origin.

**Bahia** [span. C, ˈba.βi.ɐ] (Salvador) (1) Former capital and oldest city of Brazil, founded in 1549, a progressive city port with dockyards and an export trade in cotton, coffee, tobacco, sugar and diamonds. One of the principal dockyards is run by British capital. Pop. (1930) 32,000. (2) A coast State of Brazil an agricultural district whose products are exported from the capital. The State is mountainous and watered by the R. São Francisco. Area 16,647 sq. m. pop. (estimated 1930) 413,000.

**Bahia Blanca** [span. C, ˈba.βi.a. ˈblan.kə] part of the Argentine Republic on the Atlantic coast 400 m. S of Buenos Aires, the outlet of the S. L. river region, raising wheat and wool in some localities. It is an important naval station. Pop. (1931) 107,400.

**Bahrein** [span. C, ˈba.βe.ɾi.n] Arabian archipelago in the Persian Gulf between the Qatar peninsula and the Gulf. The island is an important centre of the pearling industry. Bahrain, the largest island with the 2nd town Manama. pop. 25,000. It was captured by the British. The island is owned by an Arab dynasty and is a British protectorate. Pop. estimated at 250,000.

**Baise** [nl. E] city of ancient Italy in the Campanian district c. 10 m. W. of Naples on the bay of Baiae. It was a country seat of the Roman Emperors, previously wealthy senators attracted by its beauty and its mineral springs had built villas there. Baiae later became infested with malaria and was deserted in the 19th cent. Some fine remains of Roman architecture are still to be seen.

**Baikal Lake** [nl. E, ˈba.ɪ.kəl] (Dalsk See) lake in S. central Siberia at the Mongolian border enclosed partly by the central Asian plateau and partly by the mountains S.W. of it. It is c. 1,600 ft. above the sea, is fed by mountain streams and is the largest non-saline lake in Asia or Europe. It is frozen over for 5 months of the winter but is navigable in summer although subject to violent storms. The average length is c. 900 ft. and there is an overflow to the Yenisei. Sturgeons and salmon are abundant. Area 13,000 sq. m.

**Bail** (nl. w.) the legal use until trial of a person accused of a criminal offence. Two persons standing surety for his appearance at a trial. It may be allowed in all cases except that of treason but is very often refused when the offence is serious.

**Bailor or Bailment**

**Bailor** Old, ˈbaɪ.lər

**Bailiff** legal officer who puts in force a writ or the arrest, or is responsible for the execution of the County Court Act 1888. It is provided that there shall be one or more bailiffs appointed by the justice whom the justice may remove and appoint and remove, write, and execute the writs of the court. He may also take persons and things and a property and his acts and the acts of his officers. No person may take a thing in distress for the debt unless he is authorized by a court. He is a public officer.

**Bailment** the legal use of a thing by one person for the use of another. It is a contract by which one person delivers a thing to another for a specific purpose and the other person is bound to return it. The person who delivers the thing is the bailor and the person who receives it is the bailee.

called the *bailor*, the person who receives them is the *bailee*. A bailee who receives no reward for his services is liable only for damages arising from gross negligence or wilful misconduct. A paid bailee is liable for negligence, but not for unavoidable accident. Fraudulent appropriation by the bailee is larceny.

**Baily, Francis** (1774-1844), English astronomer, revised the *Astronomical Society's Star Catalogue* (1827), and



J. L. Baird

began the reform of the *Nautical Almanac* (1829). He first described the appearance, in total eclipses of the sun, of *Baily's Beads*. These represent the unobscured part of the sun, broken by irregularities on the edge of the moon into a string of bright spots.

**Bain, Alexander** (1818-1903), Scots educationist and psychologist, friend of J. S. Mill, held appointments in the Universities of London and Aberdeen. He wrote for the *Westminster Review* and published many important works on psychology. He was the first to advocate the application of exact

scientific method to that science, and explained many mental phenomena by reference to physiology.

**Bain Marie**, a large utensil, similar to a double saucepan, one large container having several smaller ones inside. These are surrounded by boiling water. Used for keeping sauces hot, it prevents burning or the formation of a skin.

**Bairam**, a great Mohammedan festival. The first festival called Bairam follows the fast of Ramadan, and another Bairam takes place 70 days later.

**Baird, John L.** (b. 1889), British scientist, invented and developed television (qv), also designed the "noctovisor" which records images in complete darkness.

**Bairnsfather, Captain Bruce** (b. 1887), journalist and cartoonist, who came into prominence in the World War with the Old Bill cartoons, featuring the famous prototype of the British private. He first drew these to entertain his companions in the trenches, and later sent one to a magazine. It was so enthusiastically received by the public that Old Bill became a national figure. Bairnsfather also wrote books on the War, including *Bullets and Billets*, *The Better 'Ole*, *Old Bill M.P.*, and *Fragments from France*. *The Better 'Ole* has been both dramatised and filmed. He has lectured in England and the U.S.A. and published *Laughing Through the Orient* in 1933.

**Bajazet (Bayezid) I** (1347-1403), Sultan of Turkey, 1389, surnamed "Ilderim," was an active warrior who conquered Bulgaria, Serbia, Macedonia, and Thessaly, organised a ten years' blockade of Constantinople, and defeated the combined armies of Poles, Hungarians, and French at Nikopol in 1396. Timur (Tamerlane) defeated and captured him at Angora in 1402, and legend states that he was kept in a cage like an animal (Marlowe's *Tamburlaine*).

**Bajazet (Bayezid) II** (1447-1512), Sultan of Turkey, 1481. He fought against Venice 1499-1502, annexing parts of the Morea (Peloponnesus), and

was at war with Egypt and Persia but he is better known for the luxury of his court and as the builder of magnificent mosques

**Bakelite** a synthetic plastic material named after its inventor a Belgian Dr L H Baekeland (1909) It is manufactured by the interaction of phenol and formaldehyde which gives a viscous fluid on heating this is moulded to a temperature of about 180 C and under pressure the mass sets to a hard material which is infusible and insoluble in the large majority of solvents Bakelite is used in large quantities in the electrical industry for the manufacture of articles such as switch covers etc since it is an excellent insulator It is also used as a substitute for wood in furniture manufacture See also PLASTICS

**Baker Sir Benjamin** (1840-190 ) English engineer assisted Sir John Fowler (qv) in many projects among them the construction of the Metropolitan and District Railways (London) the Forth Bridge (1890) and the Aswan Dam (190 )

**Baker Sir Samuel White** (181-1893) British explorer famous for his discovery of Albert Nyanza (1864) and the Murchison Falls He preceded General Gordon as Governor General of the equatorial region of the Nil (1870) and travelled widely throughout the world Baker published many travel books and 1 geographical works

**Bakewell**, Derbyshire market town c 90 m N of Derby in picturesque hilly country There are medicinal springs near the town which is remarkable for its antiquities including earthworks said to be Saxon The grammar school and almshouses are of the 17th cent Pop (town) c 3000

**Bakewell Pudding** to make

4 oz short crust pastry

*Filling*

4 tablespoonfuls red jam

3 oz ground almonds

3 oz cake crumbs

2 oz castor sugar

2 oz butter

1 egg

A little milk if necessary

Essence of almonds

Line sides of pie dish with pastry Place am in bottom Cream butter and sugar add beaten egg with crumbs almonds and essence If very dry add a little milk Spread the mixture over jam and bake in a moderate oven (375 F) for 1 hour

**Baking Powders** are used for giving a spongy texture to the bread or other material that is being baked This object is achieved also by the use of yeast Numerous mixtures are available one of the commonest containing tartaric acid and sodium bicarbonate this gives off carbon dioxide on being moistened the evolved gas permeating and lightening the dough

Self raising flour has already had baking powder added

**Baking Tins** are usually of tinned iron and oblong in shape A sunken space where the fat collects for basting a strainer across one corner to free gravy of solid particles as it is poured into the sauce boat and handles which are recessed into the side itself are improvements which reduce labour A cover is sometimes supplied with deep lids and the combination is called a roaster Meat cooked in these tends to retain its moisture and the oven requires less cleaning for the spluttering fat is kept inside the tin

**Bakst, Léon** (1866-194 ) Russian painter and scene and costume designer He designed settings for Greek tragedies and in 1908 made a name as scene painter for Diaghilev Bakst had a great influence on art and fashion especially on scene designing of which he was one of the first modern masters

**Baku**, town in the province of Azerbaijan in the Federal Republic of Transcaucasia (U.S.S.R.) situated on the W coast of the Caspian Sea It is the capital of the province and the centre of a large oil field It is connected with the Black Sea ports Batumi and Poti Naphtha is

most important product Baku is also a distributing centre for trade between USSR and Persia. There is a university in the town. Although it is of Asiatic origin, industrial development has brought in a large European Russian element. Pop (town and district) *c* 575,200.

**Bakunin, Mikhail** (1814-1876), Russian anarchist. Bakunin was an aristocrat who resigned from the Imperial Guard because of his hatred of despotism. He lived in Germany, France, and Switzerland, and played an active part in all revolutionary movements. In 1849 he was condemned to death after the Dresden insurrection, but was finally handed over to the Russian Government and imprisoned in Siberia, whence he escaped abroad in 1861. He was a member of the First International (*qv*), but was expelled by Marx's party in 1872. His three great principles of Atheism, Anarchism, and Insurrection are explained in his *Leu et l'État*. See also ANARCHISM.

**Bala.** largest natural lake in Wales, drained by the R. Dee. Area, *c* 1½ sq m.

**Balaclava** (Crimean War) (Oct 25, 1854) an indecisive battle between the British under Lord Raglan and the Russians under Prince Menshikov (30,000). The three most memorable exploits of the battle were (1) the repulse of a charge of the Russian cavalry by the Highland Brigade in line under Sir Colin Campbell, (2) the repulse of the Russians, who had entered the valley of Balaclava, by the Heavy Cavalry Brigade under General Scarlett, though only half their number, (3) the charge of the Light Brigade (celebrated by Tennyson) under Lord Cardigan, who captured the Russian batteries, but, when shelled from all sides, was compelled to retire.

**Balakirev, Mily Alexeevich** (1836-1910), one of the earliest of Russian "nationalist" composers. Collected and published Russian folk-songs, besides composing symphonies, over-

tures, songs, etc., of his own. Encouraged younger composers of the new Russian school.

**Balalaika**, a Russian musical instrument resembling the guitar (*qv*), but differing from it in its triangular shape. Balalaika orchestras have been heard in England in recent years.

**Balance**, see MEASURING INSTRUMENTS.

**Balance of Payments**. This term is used in economics to describe the relation between the sum of all payments into and out of a given country.

The great bulk of payments are for goods sold and bought—*i.e.* for export and imports of merchandise. The *balance of trade* is the relation between the values of exports and imports. In addition to payments for exports and imports of merchandise, there are a number of sums that must be taken into account to reach an estimate of the total balance of payments. In the long run, the *balance of payments of a country must be in equilibrium*, though the balance of trade need not necessarily be in equilibrium. Payments received by a country for a surplus of exports may be used up by payments for services, or may be offset by an influx of gold or by loans placed abroad, while the cost of a surplus of imports may be paid for by the supply of services for foreigners, by an export of gold, or by borrowing from foreign countries.

It is important, therefore, not to confuse the terms *balance of payments* and *balance of trade* (*qv*). Some countries habitually have a surplus of imports—such as the United Kingdom, which pays for her extra imports by furnishing to foreigners shipping services, banking and insurance services, and the use of British capital lent to foreigners, the interest on which is constantly flowing into Great Britain. Since these services take the place of exports in exchange for imports, they are called *invisible exports*. Conversely, many countries, such as Australia or Argentina, habitually have a surplus of merchandise exports over imports.

In such a case more goods must be sold abroad than are bought abroad because the country is paying for services—such services as those supplied by Great Britain and described above. Thus Australia or Argentina's payments of interest on capital borrowed from British investors, payments of shipping freights on the carriage of their goods to foreign markets etc. are termed the invisible imports of Australia or Argentina because they are services bought just as goods are bought and they must be paid for by the sale of extra exports.

Two items of importance in the American balance of payments are Tourist Expenditures and Immigrant Remittances. The sum spent by American citizens who take their money from home and spend it traveling etc. in France, Austria, Italy etc., figure in the United States balance of payments as invisible imports while these same sums would be counted in the countries where the money is spent as invisible exports. American tourist expenditures abroad during the years 1922-32 averaged between one tenth and one fifth of her total merchandise imports. Remittances by immigrants in the United States to their relatives in Europe during the same period exceeded America's receipts of principal and interest on War Debt account.

When visible and invisible imports and exports do not balance the gaps may be filled by the shipment of gold from one country to another—an export of gold thus supplementing the exports of goods (see GOLD STANDARD).

The gaps may also be filled by loans of capital since when a loan is made, e.g. by British investors to Austria, the sum lent is transferred to Austria thus constituting a payment out of Great Britain. Such a loan therefore would go to be added to the value of British imports for which sums must be paid out (Investment of capital abroad though belonging on the side of the balance of payments account with visible and invisible imports is often

rather confusingly called the *export of capital*. Though itself a shipment of funds it is eventually paid for as a service in the form of interest which naturally finds its place on the export side of the balance of payments account.)

The table which follows shows the Balance of Payments of the United Kingdom as estimated by the Board of Trade. (Exact figures are never available for most of the items. Figures of merchandise trade and gold movements are available but the other items must be largely estimated. The discrepancy in the total balance is due to errors—and partly to short term capital movements and time lag.)

BRITISH BALANCE OF PAYMENTS  
1 Million £ Sterling

	1913	1924	1929
Import of Merchandise (including oil etc.)	783	1391	1239
Export of Merchandise (excluding oil etc.)	651	933	848
Visible Export			
Net Shipping Income	95	140	130
Interest on Overseas Investment	310	320	270
Receipts (Short term interest and Commissions)	35	76	80
Miscellaneous receipts (Insurances, etc.)			
Total Visible Export	340	436	480
Total Imports—Visible	991	1388	1329
Balance—Total Exports and Imports	+ 308	+ 27	+ 29
Inter-governmental payments received (+) / payments sent (-)	—	— 25	+ 24
Gold Movement (Increase (+) / Decrease (-))	— 24	+ 12	+ 18
Capital Movement (Long term only)—Exports of Capital	— 195	— 135	— 95
Total Balance including gold, capital movements, etc.	— 14	— 81	+ 34

This table shows that the United Kingdom had an excess of imports of merchandise over exports of merchandise. Her balance of trade is what is very misleadingly called "unfavourable". It is so called since if *trade only* were taken into account, it is obvious that this country would be paying out to foreign countries more than she could afford to pay—or, in other words, more in value than she receives from her exports of goods. But it is clear from the table that she could afford to buy more goods than she sold because she was paid more than enough for the services she sold to make up the difference. In other words, her balance when invisible exports are taken into account was "favourable" to the amount of £208 million in 1913, and £97 million in 1924. Had this country not sold these services in exchange for the import surplus she would not have been able to remain on the *gold standard* (q v). As it was, she was not only in a position to buy extra imports, but also to lend close on £200 million overseas in 1913, £135 million in 1924, and £95 million in 1929.

If we examined the balance of payments of a country like the Argentine (or the United States before the War), we would find the shipping, interest, and other items under invisible exports in the British balance above the line instead of below it, and they would be invisible imports, while the exports of goods would have to be greater than the imports to give a favourable balance of payments. Capital movements would be plus items to fill gaps in the balance.

The great changes brought about by the War and the Treaty of Versailles in the balances of payments, especially of Germany (which had a balance similar to that of Great Britain before the War) and the United States (which since the War has become a great lending nation)—are largely responsible for the great financial crisis of 1931–3. The British balance showed little difference in general character after the

War until 1931, when the "surplus available for capital export" was reduced to a deficit. But Germany's balance was affected by her need to borrow capital (a) to stabilise her currency after the post-War *Inflation* (q v), and (b) for working capital for industry, all home sources having been wiped out by the inflation, and by the payment of *Reparations* (q v).

This made enormous gaps in her balance, in spite of every effort to increase her export surplus, which were filled by shipments of gold so long as she could stand that, and by enormous borrowings. This could not go on permanently, because when borrowings increase too fast, the interest to be paid on them (on the other side of the account) grows faster (see GOLD STANDARD).

Meanwhile, the United States' balance of payments changed in an even more extraordinary way. During the War American nationals bought most of the foreign-owned shares and bonds invested in the United States. The United States Government also lent large sums to the Allies, and after the War Americans began investing their capital abroad. Thus America changed from a debtor to a creditor nation, and became the receiver of payments of interest in large amounts. She still has a surplus of merchandise exports, as she had before the War, to which these interest receipts, as invisible exports, were added on one side of her account. She still has a number of invisible imports, chief among them being tourist expenditures abroad and immigrant remittances, which roughly offset interest receipts and war debt receipts, but this left a balance of exports (visible and invisible) over imports (visible and invisible). This gap was filled by gold imports (see GOLD STANDARD) in part, but chiefly by loans to foreign Governments and industrial enterprises. The following table shows the American Balance of Payments in 1921 and 1929 (see CAPITAL EXPORT).

**U.S. BALANCE OF PAYMENTS**  
1 Millions of Dollars

	1924	1929
Merchandise Exports	4334	8447
(Excess of Merchandise Export	(+ 832)	(+ 848)
Cinema Royalties	66	64
Net return from Foreign Investment (short and long-term)	412	868
Interest and principal on War Debt Account	183	207
Total Invisible Export	692	837
TOTAL EXPORTS VISIBLE AND INVISIBLE	5026	9283
Merchandise Import	3921	4799
Tourist expenditures	273	638
Immigrant emitties	279	223
Missionary and Charitable contribution	23	49
Other invisible items	115	197
Total Invisible Import	722	1107
TOTAL IMPORTS VISIBLE AND INVISIBLE	4724	8906
Balance of Visible and Invisible Imports and Exports (Export surplus +)	+ 802	+ 377
Gold Movement India (+/-)		
Excess (+)	- 236	- 120
Capital Movements—long and short-term loans to foreigners	- 517	- 306
Balance with Gold and Capital Movements	+ 43	- 49

**Balance of Power** the name given to a principle of European policy aiming at preventing any one Power from obtaining a predominant position in Europe. The application of this policy in practice resulted in many different combinations of power in Europe from the 16th to the 19th centuries and in several devastating wars. France and England combined to resist the power of the Emperor Charles V. France, England and Holland combined against Philip II of Spain. French power under Louis XIV was defeated by a combination of England and several other Powers

as was the ascendancy of Napoleon a century later. After 1870 the application of this policy to resist the growing power of the German Empire divided Europe into two armed camps: the Entente Cordiale (qv) and the Triple Alliance (qv). This situation developed into the World War. In the League of Nations an attempt is being made to prevent the ascendancy of any one Power without using the method of military alliance so likely to lead to war.

**Balance of Trade** the relation between the value of a country's imports and exports. It is said to be favourable if the value of exports exceeds the value of imports and unfavourable or adverse if the value of imports exceeds the value of exports. A country's balance of trade may however be unfavourable when it has a favourable balance of payments (qv). See also FOREIGN TRADE, MERCANTILISM, BALANCE OF PAYMENTS.

**Balanoglossus**, a worm-shaped animal of great zoological interest, a primitive member of the group also containing the vertebrata (qv) as attested by many resemblances it shows to the Ascidians or sea squirts (qv).

**Balata**, a gum exuding from trees found chiefly in Guiana and Venezuela. It is of a reddish brown colour with some characteristics of gutta serena. It is used for coating machinery, driving belts, making waterproof shoe soles and similar purposes. See also BELTS, DRIVING.

**Balaton Lake**, largest inland sea in Hungary, 51 m long, 2-9 m wide and 60 m from Budapest. It is a popular health and holiday resort.

**Balbo, Italo** (b. 1896) Italian General and Minister for



General Balbo



Air, Chief of the Fascist Militia until 1924. He is famed for two formation flights, to Brazil in 1930-1 and to Chicago via Greenland and back to Italy in July 1933.

**Baldachino**, see CANOPY

**Balder** (myth), the Norse sun-god, a son of Odin, met his death through a sprig of mistletoe, which Loki, the god of evil, cast at him. This has been interpreted as a representation of the overwhelming of the sun by winter, an event of great importance in N countries, on which many myths are based.

**Baldwin**, the family name of the counts of the House of Flanders. The 9th of the line (1172-1205), born at Valenciennes, became **BALDWIN I**, first Latin Emperor of Constantinople and Emperor of Rumania. He took a prominent part in the 4th Crusade, and was elected to the Imperial crown on the capture of Constantinople (1204). He was embroiled in a war with his rival Boniface of Montferrat, and was eventually captured at the siege of Adrianople, by John of Bulgaria, and died or was killed in prison.

**BALDWIN II** (1217-1273), Emperor of Constantinople and Rumania (1228), nephew of Baldwin I, travelled through Europe to raise help for a new campaign, without much success, and in 1261 lost Constantinople to Michael Palaeologus.

**BALDWIN I** (1058-1118), prince of Edessa, and first King of Jerusalem, fought in the 1st Crusade with his two brothers, and later assumed the title of Count of Edessa. He held the balance between the crusaders and the Armenians, and in 1100 succeeded his brother at Jerusalem, where he became protector of the Holy Sepulchre and first king. With the aid of the Genoese he extended his territory over Caesarea (1101), Acre (1104), and Beirut and Sidon (1110), also engaging the Egyptians, whom he pushed back to the Red Sea in the campaign of 1115-18.

**BALDWIN II** (d. 1131), de Burg, King of Jerusalem, perhaps nephew of Baldwin I, whom he succeeded in 1118.

By vigorous fighting in N Syria he extended the kingdom of Jerusalem to its widest limits. He abdicated in 1131, and retired to the monastery of the Holy Sepulchre.

**BALDWIN III** (1120-1162) became King of Jerusalem at 11 under the regency of his mother. Edessa was lost in the first years of his reign, and the 2nd Crusade against Damascus, in which he fought, proved a failure. Baldwin was the first King of Jerusalem born in the East, and was more of a court-sovereign than his warrior-priest predecessors. His reign marks the waning of Frankish power in Asia Minor.

**BALDWIN IV** (1161-1185), the Leper, King of Jerusalem, son of Almeric I, and nephew of Baldwin III, came to the throne at 13 under a regency. His kingdom was attacked by Saladin. After long intriguing, he abdicated in 1183 in favour of **BALDWIN V**, the son of his sister Sibylla by William of Montferrat, who reigned until 1186.

**Baldwin**, Stanley (b. 1867), British statesman, born at Bewdley, Worcs, for which he has been M.P. since 1908. For 20 years previous to his election he had been connected with the Baldwin iron-works at Stourport, of which he became chairman. He was Financial Secretary to the Treasury, 1917, in the Lloyd George Coalition, and, in 1921, President of the Board of Trade. The famous Carlton Club meeting of Conservative M.P.s in Oct. 1922 was the turning-point in Baldwin's career. Bonar Law, who had already retired from the Coalition, took firm action over the Chanak affair. He attended the Carlton Club meeting, and declared in favour of the Conservative Party going to the country at the next election as an independent party. The meeting decided in favour of ending the Coalition, and Lloyd George resigned. Bonar Law became Prime Minister, and made Baldwin Chancellor of the Exchequer. It was as Chancellor that he was sent to America to negotiate a War Debt settlement (see INTER-ALLIED DEBTS). Bonar Law resigned the Premiership in 1923 on account of ill-health, and Baldwin became

**Prime Minister** He in the same year decided to appeal to the country on the issue of protection for home industries and was defeated. The Socialists came into office but were beaten at a General Election on the Zinovieff letter in 1914 and Baldwin again became Prime Minister. His administration continued until 1929 when the second Socialist Government came into office. In 1931 Conservatives, Liberals and a few Socialists joined in a National Government with Mr Ramsay MacDonald the Socialist, as Prime Minister and Mr Baldwin leader of the Conservative Party as Lord Privy Seal.

**Bale, see BASEL.**

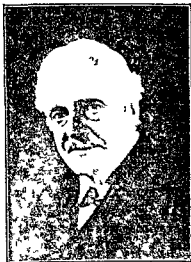
**Balearic Islands**, archipelago off the E coast of Spain now a separate province. There are four main islands—Majorca (Mallorca) Minorca (Menorca) Ibiza and Formentera and a number of smaller islets. The principal occupations are fruit growing and fishing. Olives and almonds are exported. The islands appear to have been conquered in turn by each of the dominant Mediterranean races of antiquity. During the early Middle Ages they were successively occupied by the Vandals and the Saracens and were absorbed by Spain in the 14th cent. Britain occupied Minorca in 1708 retaining it during the greater part of the century. In ancient times the islanders were warlike and renowned slingers the name Balearic being derived from the Greek word for to throw. The islands have recently been the scene of considerable archaeological discoveries. The capital is Palma in Majorca. Area 103,000 sq m. pop. estimated (1931) 368,200.

**Baleen**, or *Whalebone* is the name given to the horny plates forming the sieve in the mouth of Whalebone whales (see WHALES).

**Balle, Michael Wm.** (1808-1870) Irish musical composer trained in Milan and Rome. He appeared as a singer in opera houses in France and Italy. The *Bohemian Girl* was by far his most popular work but he wrote many other operas and songs

including the Victorian favourite *Come into the Garden Maids*.

**Balfour Arthur James, 1st Earl of** (1848-1930) British statesman and philosopher represented Hertford (1874-85) and E. Manchester (1885-1905) in Parliament. Having been made private secretary to the Marquis of Salisbury Foreign Secretary (1878) he went with him to the Berlin Congress. He won fame on the publication of *The Defence of Philosophic Doubt* (1879). Under Lord Salisbury he held



Lord Balfour

minor appointments until in 1887 to the general surprise he succeeded Sir Michael Hicks Beach as Chief Secretary for Ireland and was dubbed by the Nationalists 'Bloody Balfour'. This post he held during the exciting and difficult times of the Parnell Commission and the O'Shea divorce case. From 1891 to 1892 and again from 1893 to 1902 (when he became Premier) he was First Lord of the Treasury and Leader of the House of Commons. During these periods his attitude towards education and the

Transvaal operations was strongly criticised, but his handling of the quarrel with Russia was universally approved.

His premiership (1902-6) was agitated by fiscal questions, and his position in this respect was never clear. At the election in 1906 he lost his seat in E. Manchester, and until 1911, when he retired, he led the opposition, but without whole-hearted support. The outbreak of the World War recalled him to politics, and, in 1916, he became First Lord of the Admiralty and, later, Foreign Secretary, in 1917 the "Balfour Declaration" promised British support to the project of a national home in Palestine for the Jews. In 1919 he became Lord President of the Council, and was elected Chancellor of Cambridge University. At the International Conference in Washington (1921) he signed a treaty for the limitation of armaments (between the U.S., British Empire, France, and Japan), and the nine-power pact concerning China. He was the author of the famous "Balfour Note," a masterly exposition of British policy in regard to Inter-allied War Debts (see REPARATIONS). In 1922 he was raised to the peerage, and in 1925, as Lord President of the Council under Mr. Baldwin, he headed the Civil Research Committee.

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Balfour of Burleigh, Lord (Alexander Hugh Bruce) (1849-1921), Conservative politician, Secretary for Scotland, and member of the Cabinet (1895-1902), was best known for his work on many Commissions (on Factories, 1874-5, Educational Endowments, 1882-9, Metropolitan Water Supply, 1893-4, Rating, 1896, etc.). He published some of his addresses on education, in which he was greatly interested, and for which he did a great deal.

Bali, island, Dutch E. Indies, E. of Java, also known as Little Java. It is of volcanic origin and very mountainous. The principal productions are rice, fruit, coffee, copra, and tobacco. The inhabitants are of Hindu stock and excellent craftsmen. Its picturesque scenery and the quaint customs of the inhabitants have made it a favourite haunt of cinematographers who in recent years have done much to make the island known to the general public. The Dutch acquired the island in 1743, it forms with Lombok (q.v.) a colonial Residency. The capital is Singavadya Area, 2100 sq. m., pop. estimated at 980,000.

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His son, Edward, invaded Scotland in 1332 and, after defeating King David II at Dupplin Moor and capturing Perth, was crowned at Scone. But the nation rose against him, and he was routed at Moffat, where his brother Henry was killed. He re-

med but was expelled again in 1335 rendering to Edward III. He died 1363.

*See also* BALLIOL COLLEGE OXFORD. **Balkan Peninsula**, the most E of the European peninsula projecting into the Mediterranean Sea and comprising a mountainous area S of the Danube and Sava between the Adriatic and Ionian Seas on the W and the Black Sea of Marmora and the Aegean on the E. Area c 200 000 sq m. Pop. (see under separate States).

**Relief** The whole peninsula is a rugged mountainous area relieved only by the plains of Thessaly and Macedonia. The Balkan system running parallel to the Danube continues the Alpine axis of S Europe. The other ranges tend S (Dinaric and Albanian Alps and mountains of Greece) and their structure is very broken.

**Rivers** Only the rivers of the N are of any size. Besides the Danube and the Sava the chief are the Maritsa and Vardar flowing SE and the right bank tributaries of the Danube of which the Morava is the most important.

**Commerce** The economic development of the Balkan Peninsula has been hindered by political instability. Fruit and wheat are produced in the lowlands but the large area of barren mountain restricts production. Minerals probably exist in quantities but are not exploited. Petroleum in Rumania and iron in Greece are the most valuable minerals worked. Coal and various metallic ores exist in the mountains of the peninsula.

**Political Divisions** The principal states are Yugoslavia, Bulgaria, Albania, Greece and the remnant of European Turkey. Rumania, although almost entirely N of the geographical area of the Balkans, belongs politically to the Balkan system.

**Communications** The valley of the Morava is the most important line of communication in the peninsula. The railway from Belgrade follows this valley and its tributary the Nishava

into that of the Maritsa whence Constantinople is reached. Nish is an important route town for here the branch line to Salonika and the Vardar joins the main Belgrade-Constantinople route. Although provided with good trunk routes the communications of the Balkans are in general poor.

**History** The physical character of the Balkan Peninsula in ancient times militated against the formation of a powerful State embracing the whole area. This difficulty added to the great variety of the races which settled in the peninsula as the Roman Empire declined has made the Balkans throughout their history the dangerous spot of Europe particularly in the last century (*see separate countries* also **BALKAN WARS** **WORLD WAR**). The post-war settlement has revised the Treaty of Berlin and divided the peninsula afresh.

**Balkan Wars** The (1912-13) resulted in the diminution of the Turkish Empire making Turkey in Europe merely a small territory round Constantinople instead of a wide area extending over Macedonia and Bulgaria (*see* **EASTERN QUESTION**). The three largest Balkan States, Greece, Serbia and Bulgaria, the last a semi-independent State under the suzerainty of the Sultan, united in an attempt to defeat the Turks. Their main objectives were the liberation of Christians from the oppression of the Turks and the annexation of Macedonia and Thrace, both of which contained Greeks, Serbs and Bulgars. Serbia had a secondary objective—the acquisition of an outlet to the Adriatic Sea. The alliance agreed on the division of the spoils before embarking on the war except for the contested Monastir area which was to be allocated by the Tsar of Bulgaria. The Great Powers notified the Balkan League that they objected to war with Turkey and would oppose any alteration in the Balkans. Montenegro disregarded these warnings and declared war (Oct 8 1912.)

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The results of the war surprised Europe. The Balkan League defeated Turkey decisively. By the end of 1912, except for a few isolated fortresses, the whole of European Turkey lay within 30 m. of Constantinople and in the hands of the Balkan League. But Austria and Italy refused to allow Serbia to annex any Albanian ports, and together with Russia, forbade the Bulgarians to advance on Constantinople. An armistice was concluded, and an Ambassadors' Conference attempted to settle the division of territory. Its decisions were repudiated by Turkey, and hostilities were resumed in 1913.

In May, 1913, a Treaty of London was signed, only to be torn up immediately after. By its provisions Albania was to be independent, thus acting as a check on Serbia; Greece obtained Salonika and territory in S. Macedonia; Serbia obtained N. and Central Macedonia, and Bulgaria was to have Thrace. Serbia's large acquisitions in Macedonia, however, granted in compensation for her failure to obtain an outlet to the Adriatic, angered Bulgaria, and in June she attacked the Serbs, and was attacked in turn by the Greeks, Serbs, Rumanians, and Turks. The 2nd Balkan War was the result of quarrels over the spoils of the 1st. The main changes following the 2nd war were the loss of territory by Bulgaria to her enemies, and Turkish gains, in particular the recapture of Adrianople. The World War in 1914, however, threw the Balkans into the melting-pot once again.

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**Ballarat**, city in Victoria Australia c 75 m W of Melbourne Ballarat is now an important market and rail centre and there are local woollen flour and iron industries It was the scene of a gold rush in the 19th century The early deposits were alluvial but are now exhausted quartz reefs however are of considerable value Pop (1931) 41 750

**Ballet** [*BAL. LA*] a stage performance carried out by means of dancing pantomime and music

Dancing is one of the oldest and most primitive of human impulses but the highly formalised dance for the expression of drama and emotion that we now know as the ballet dates back no farther than the 18th cent when the famous French ballet master Noverre conceived for the first time the idea of the ballet as something more than a display of technique for its own sake and produced ballets that had a dramatic significance It was in his day that the first great dancers such as Vestris and Camargo arose and that composers of the importance of Gluck and Lully began to compose music especially for the ballet

There have been three main schools of ballet the French the Italian and the Russian Modern ballet is derived from the first But Italy soon produced the dancers with the purest

and most classical styles while Russia in later times has given the world all that is most brilliant sensational and modern in ballet The ballet was never native to England but has always been a welcome visitor In the early 19th cent all the most famous dancers were to be seen in London including Taglioni the greatest dancer of her and perhaps of any day and the celebrated Carlotta Crispien sister of the equally famous soprano Taglioni seems to have come at the climax of the Italian ballet for both it and the French ballet continued along conventional and uninspired lines But the Imperial School of Ballet in St Petersburg (now Leningrad) had unknown to the rest of Europe become a thriving institution with a store of the finest talent trained carefully and soundly in the fine traditions of the Russian School Though the performances that were given at that time in the St Petersburg theatre excelled in every respect those that were to be seen elsewhere it was not until Diaghilev and his band of picked dancers and opera singers burst upon an astonished and delighted Paris that Europe realised the decadence of its own ballet and the superb virility and originality of the Russian Thus his first season which introduced Anna Pavlova among others took place just before the War and those pre-War years must be counted the most brilliant in the development of Russian—or of world—ballet Diaghilev was responsible for making the ballet the expression of modernism that it soon became He had at that time a flair for recognising any latent first class talent whether in dancing music or painting He and the artists he had brought with him from Russia settled permanently in W Europe and his ballets had the finest choreographers to arrange the dances dancers to interpret them modern French artists to paint the *décor*s and modern composers to supply the music In 1910 Stravinsky wrote *The Fire Bird* for Diaghilev in 1912 *Petrushka* and in 1913 *Le Sacre du Printemps*



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**Ballarat**, city in Victoria Australia c 75 m W of Melbourne Ballarat is now an important market and rail centre and there are local woollen flour and iron industries It was the scene of a gold rush in the 19th century The early deposits were alluvial but are now exhausted quartz reefs however are of considerable value Pop (1931) 41 750

**Ballet** [*bal. tā*] a stage performance carried out by means of dancing pantomime and music

Dancing is one of the oldest and most primitive of human impulses but the highly formalised dance for the expression of drama and emotion that we now know as the ballet dates back no farther than the 18th cent when the famous French ballet master Noverre conceived for the first time the idea of the ballet as something more than a display of technique for its own sake and produced ballets that had a dramatic significance It was in his day that the first great dancers such as Vestris and Camargo arose and that composers of the importance of Gluck and Lully began to compose music especially for the ballet

There have been three main schools of ballet the French the Italian and the Russian Modern ballet is derived from the first But Italy soon produced the dancers with the purest

and most classical styles while Russia in later times has given the world all that is most brilliant sensational and modern in ballet The ballet was never native to England but has always been a welcome visitor In the early 19th cent all the most famous dancers were to be seen in London including Taghioni the greatest dancer of her and perhaps of any day and the celebrated Carlotta Grisi sister of the equally famous soprano Taghioni seems to have come at the climax of the Italian ballet for both it and the French ballet continued along conventional and uninspired lines But the Imperial School of Ballet in St Petersburg (now Leningrad) had unknown to the rest of Europe become a thriving institution with a store of the finest talent trained carefully and soundly in the fine traditions of the Russian School Though the performances that were given at that time in the St Petersburg theatre excelled in every respect those that were to be seen elsewhere it was not until Diaghilev and his band of picked dancers and opera singers burst upon an astonished and delighted Paris that Europe realised the decadence of its own ballet and the superb virility and originality of the Russian This historic season which introduced Anna Pavlova among others took place just before the War and those pre-War years must be counted the most brilliant in the development of Russian—or of world—ballet Diaghilev was responsible for making the ballet the expression of modernism that it soon became He had at that time a flair for recognising any latent first class talent whether in dancing music or painting He and the artists he had brought with him from Russia settled permanently in W Europe and his ballets had the finest choreographers to arrange the dances dancers to interpret them modern French artists to paint the *décor* modern composers to supply the music In 1910 Stravinsky wrote *The Firebird* for Diaghilev in 1912 and in 1913 *Le Sacre du printemps*

These three ballets probably constitute his finest work. The combination of the new and strange idioms of the music, the striking beauty of the settings and of Fokine's and Nijinsky's choreography made an extraordinary impression whenever the Stravinsky ballets were performed. Nijinsky, probably the finest male dancer that ever lived, astounded everyone with his leap in *La Spectre de la Rose*, no less than with the poetic beauty of his and his partner Karsavina's dancing, and ballets such as Tchaikowsky's *Swan Lake* and *Les Sylphides* showed the soundness of the dancers' classical training and the purity of their style. After the War the modernism of the Russian ballet became so aggressive as to alienate some of its former admirers. Nevertheless, the ballet as a whole continued to give brilliant performances of such delightful things as *La Boutique Fantasque*, with Rossini's music, *Carnaval* with Schumann's, Tchaikowsky's piquant *Casse-Noisette*, and revivals of the superb pre-War ballets of Stravinsky, whose later works for the company were of a definitely lower standard.

One of the best post-War ballets is de Falla's *Three-Cornered Hat*, which represents the better type of modern ballet that Diaghilev produced.

While this company was carrying out its experiments in modernism, a former member of the company was preserving more old-fashioned standards. Anna Pavlova, in her travels round the world, declined to take with her the music of Satie, the choreography of Nijinsky, or the settings of Bracque. She performed *La Fille mal Gardée* or *Giselle* in and out of season, seeing to it that her supporting dancers were of the first class, and that her own incomparable dancing remained unrivalled.

Pavlova gained wider fame, and was seen by more people than any dancer who has ever lived. Apart from her extreme technical perfection, she had a certain spiritual quality that set her apart from all other dancers. Her death at the height of her powers and

popularity created a greater impression of loss than probably that of any other artist.

A short while afterwards Diaghilev's death broke up his famous company, and its members, including such brilliant dancers as Karsavina, Lopokova, Sokolova, Woizikowsky, Idzikowsky, and Lifar, have not since been seen together. The first two, however, have done valuable work in the recent attempts to form an English School of ballet, by appearing at performances of the Camargo Society and at Sadler's Wells, assisted by such able British dancers as Anton Dolin and Frederick Ashton. In 1933 Lopokova's piquant dancing was seen again in London in her revival of *Coppélia*, Serge Lifar appeared with his own company in *Spectre de la Rose*, and *L'Après-midi d'un Faune*, while the most important development in ballet since the death of Diaghilev was the arrival of *Les Ballets Russes de Monte Carlo*, with a company headed by Massine as ballet-master and choreographer *par excellence*, Danilova, Anton Dolin, and Woizikowsky. The opening of the season with Fokine's lovely *Les Sylphides* revealed, moreover, two young ballerinas, Riabushinska and Baronova, who showed great accomplishment and greater promise.

Of the new ballets produced, Massine's *Les Préludes*, a superb interpretation of Tchaikowsky's 5th Symphony in terms of the dance, with a wonderful part for Woizikowsky, was undoubtedly the most important. Besides this remarkable work, there were *La Concurrence*, a delightful ballet to whose gay spirit the choreography of Balanchine, the settings of Deraïn, and the music of Auric all contributed, *Bräu Danube*, a charming and amusing trifle with Strauss's music and apt choreography by Massine, *Scuola di Ballo*, an adaptation of a Goldoni comedy, and revivals of such old favourites as *Carnaval*, *Petrouchka*, and *Swan Lake*.

Ballin, Albert (1857-1918), German shipowner, became director-general

of the Hamburg Amerika line. The war between Germany and England was a great blow to him and he committed suicide two days before the Armistice was signed.

**Balliol College**, at Oxford University. It was founded c. 1263 by John de Balliol of Barnard Castle, Durham, father of the Scottish king of that name, the bulk of the work falling to his widow, Devorguilla. Seniority is disputed between Balliol and Merton. The earliest building extant is the Old Dining Hall (1439) converted into a reading room; the new Hall is magnificent with fine wainscoting and modern heraldic glass. There are many exhibitions and benefactions for Scottish students. Among its great masters three names stand out—Dr. Jenkins, Edward Caird, and Benjamin Jowett. Other famous alumni were Wyclif, Adam Smith, Lockhart, Southey, Swinburne, T. H. Green, Andrew Lang, Milner, Curzon, Grey of Fallodon, Asquith, and Belloc.

**Ballistics**, the science of the motion of projectiles. The elementary theory of the motion of a body projected at a given velocity away from the surface of the earth in any direction is extremely simple and will be found explained in the article **MECHANICS**. The motion of rifle bullets and other technical projectiles departs very widely from that calculated from the simple laws of motion. The spherical bullet and shell have now been superseded entirely by the cylindrical pointed shape, which is given a rapid rotation around its axis by the rifling of the gun (see **GUNS AND RIFLES**). The chief reason for this is the fact that the interaction between the projectile and the air plays an enormous part in the motion, not only taking the form of a simple resistance but also tending to divert the projectile.

The rifling gives the projectile a perfectly definite rotation both as regards speed and axis, while the gyrostatic effect of the rotation prevents the projectile from changing the direction in which it is pointing. Provided there

fore that the power of the charge and other conditions remain constant, the problem of the flight of a modern projectile is perfectly definite and solvable, although extremely complicated.

The path is ascertained by a combination of pure mathematical theory, empirical formulae derived from elaborate experiment, and finally empirical corrections. Among the factors concerned are the pressure and moisture of the air, the direction of the wind (which may vary at different levels above the ground), the effect of the rotation of the earth, and the peculiar forces experienced by rotating cylindrical bodies owing to the reaction of the air (see **ROTOR SHIP**).

**Ball Mill** see **CRUSHING AND GRINDING**.

**Balloon**. It was the fire balloon of the brothers Montgolfier which first enabled man to rise from the earth and navigate the air. The principle of the fire-balloon is well known to most people since in the form of a paper bag having a sponge soaked in methylated spirit as the means of heating the air within it, it is a universal toy. Since air expands  $\frac{1}{2}$  of its volume for each 1°C rise of temperature, hot air is considerably lighter volume for volume than cold air. If the air inside the balloon is by this means made lighter than the air surrounding the balloon by an amount greater than the weight of the balloon and whatever it carries, the balloon rises and stays up so long as sufficient heat is supplied.

The fire balloon is no longer used except as a toy. Modern balloons are filled with hydrogen or coal gas, excepting in the case of airships (*q.v.*) in which helium is sometimes used.

Balloons are now used only for three purposes: for sport (the chief event being the Gordon Bennett Race) as captives for military use, and for atmospheric research. The design of these forms of balloon is very different.

The free flying balloon for purposes of sport still retains all the essential features of the earliest 18th-cent

balloon There is a large spherical gas-bag, now usually made of cotton fabric impregnated with india-rubber, and often "doped" with aluminium powder in cellulose nitrate solution, whereby its gas-holding properties are improved, and its temperature in bright sunshine much reduced This bag is enclosed in a hemispherical net, which covers its upper half and runs out into cords, from which the passenger-carrying basket is suspended

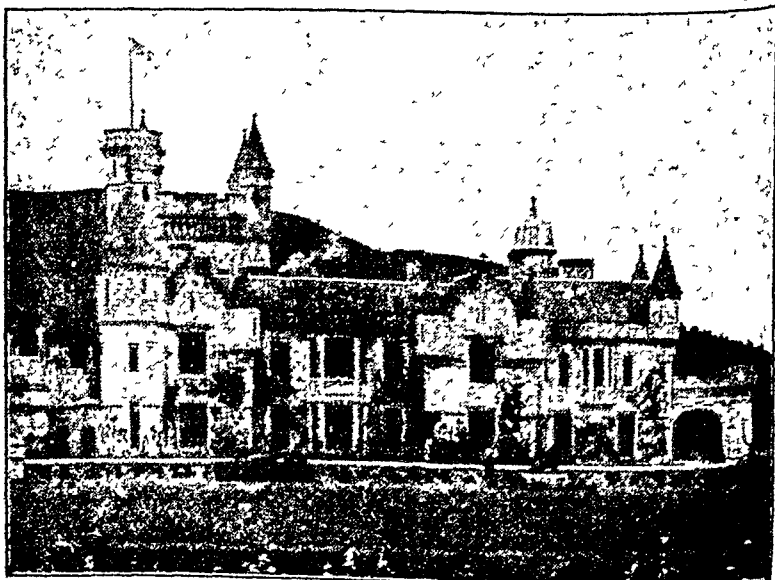
A wooden ring, called the concentrating ring, is interposed between the cord and the basket At the top of the gas-bag is a valve which can be opened from the basket by pulling a cord Furthermore, there is a ripping panel with an attached cord, whereby it is rendered possible for a large rent to be made in the balloon almost instantaneously

The use of the balloon for military observation purposes was greatly de-

veloped in the World War It will be remembered that Gambetta's escape from Paris by balloon during the siege of 1871 had a decisive effect upon French history A spherical balloon tied to the ground by a rope becomes hopelessly unmanageable for observational purposes as soon as the wind exceeds 20 m per hour, the observer being spun round like a top

During the War the French officer Caquot developed a much superior form of kite balloon, incorporating improvements due partly to attention to aerodynamic considerations, and partly to experience in practice These balloons are able to ascend to 6000 ft, and can be there maintained in a high wind, affording the observer better conditions than those obtaining in an aeroplane

The lifting of screens of fine steel wire by means of a chain of balloons is one of the methods which has been



Balmoral Castle

adopted as a protection against hostile aircraft

**Balm of Gilead** (*Cedronella*) fragrant leaved shrubby plants that require a sheltered position *Cedronella cana* has deep red flowers *C. triphylla* which is only half hardy has white flowers

**Balmoral**, royal residence W Aberdeenshire on the right bank of the R Dee The Prince Consort acquired the estate in 1856 and the present granite castle was erected three years later

**Balsam**, group of trees and shrubs producing gums and resins e.g. *Balsamodendron* produces myrrh *Boswellia* *cerifera* frankincense These and *Balsam* *impatiens* are greenhouse plants of easy culture Seeds are sown in light sandy soil in gentle heat and plants potted on until large enough for a 6 in to 8 in pot They require much moisture See also GERANIUM FAMILY

**Baltic**, The (*Baltic Mercantile and Shipping Exchange Ltd*) one of the great produce exchanges which serve as centres for dealing in certain commodities for which the market is highly specialised The Baltic which covers the purchase and sale of all cereals was founded in the middle of the 18th cent and takes its name from the Baltic Coffee House in which meetings were first held Its functions are similar (though on a small scale) to those of the famous Chicago *wheat* pit in the U.S.A. a considerable business being done in futures based on the extremely accurate harvest forecasts now available The exchange is situated in St Mary Axe London EC3

**Baltic Languages** a group of Indo-European (*q v*) languages formerly connected closely with the Slavonic (*q v*) languages They include Lithuanian Lettish and the extinct Old Prussian

**Baltic Provinces**, new sovereign republics formed out of former provinces of Imperial Russia at the conclusion of the World War (See also ESTONIA LITHUANIA and LATVIA.)

Russia acquired the provinces in the 18th cent Before that period Poland Sweden and the Teutonic knights had at different times conquered a considerable part of the Baltic Provinces

**Baltic Sea**, inland sea between Sweden Finland Russia the Baltic Provinces E Germany and Denmark At the E end it divides into the deep gulfs of Bothnia Finland and Riga The peninsulas of Jutland and Scandinavia almost enclose it to the W communication with the North Sea is by a series of island studded straits dangerous to navigation the Skagerrak Kattegat Great Belt Sound and Little Belt and by the Kiel Canal cut across the base of Jutland An underground plateau connects Jutland and the Danish Islands to Scandinavia The E sea is marked by several hollows or deeps The deepest sounding is just over 400 fathoms but the Sea as a whole is shallow (average depth c 20 fathoms) It is little affected by tides salinity is rather low and a large part is icebound in winter The coasts are for the most part low and sandy especially in the S where they are fringed by lagoons

The principal rivers flowing to the Baltic are the Vistula Oder Niemen and Dvina there are c 60 lesser streams It is connected with the White Sea by the Stettin Canal (opened 1933) The islands are most numerous in the W the chief are Zealand Laaland Funen and Bornholm belonging to Denmark and Rugen off the German coast NE of Stettin Other islands are the Aaland Islands Gotland and Öland the first belonging to Finland and the last two to Sweden

The Baltic is now no longer an important highway of trade but in the Middle Ages it was second only to the Mediterranean The produce of the E especially silver for coinage reached W Europe via the Russian rivers and caravan routes and the Baltic ports undertook the carrying trade in addition to their own exports of timber amber hides and tar (see

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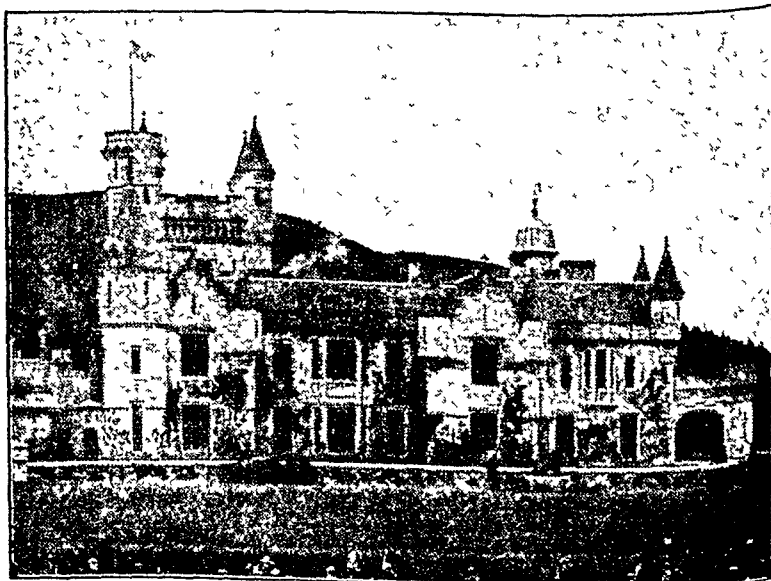
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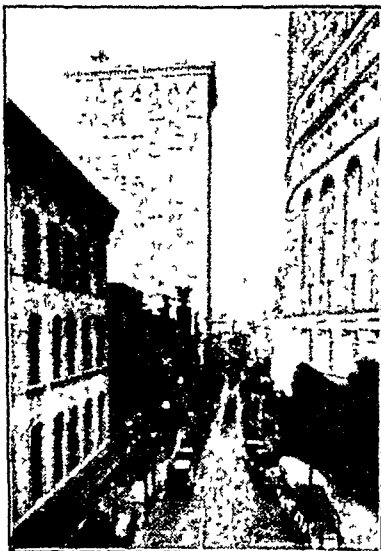
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HANSEATIC LEAGUE) The greatest length of the Baltic is c 960 m, and the maximum breadth some 400 m. Area, c 166,400 sq m.

Baltimore, Geo Calvert, 1st Baron (1580-1632), English politician, established a successful settlement in Newfoundland (1621), but met with less happy results in Virginia. Maryland was founded by his son, after whom the chief town, Baltimore, was named.



Charles Street, Baltimore

Baltimore, American port, and commercial city of Maryland, on the W side of Chesapeake Bay. Industries include iron and steel, chemicals, clothing, fruit and vegetable canning, and copper founding.

Baltimore's excellent port and harbour facilities have made it an export centre for the cotton, tobacco, and agricultural produce of several States. Notable buildings are the University of Maryland, Peabody Institute, Johns Hopkins University and Medical School, and the Court House. The

city, which was founded by Lord Baltimore in the early 18th cent., was severely damaged during the Civil War, and burnt down in 1904. Pop (1930) 805,000.

Baltistan, district of the State of Kashmir, situated in the Karakoram Himalaya about the upper Indus. The inhabitants are congregated for the most part in primitive village communities. Production is unimportant. The Baltis are of mixed race, with a Mongolian strain; they are professing Mohammedans. Mount Godwin-Austen or K<sup>2</sup> (q v) is in Baltistan. The capital is Skardo. Pop. c. 50,000.

Baluchistan, part of British India, bounded N by Afghanistan, W by Persia, E by Kashmir and the Punjab, and S by the Arabian Sea. There are two towns of importance, Kalat and Quetta, the latter being of great strategic value, as it commands a pass. It is strongly fortified, is the seat of an Indian Staff College, and has a pop (1931) of 49,000. The land is sterile, and in many districts the inhabitants are dependent on the oases of date and dwarf palms, the latter supplying the matting used in the construction of their houses, roots for food, and stems for firewood. The fauna include the tiger, leopard, and hyena.

The rainfall is negligible, and while many of the valleys are well cultivated with abundance of water at hand, in certain districts irrigation conditions are not satisfactory. Cereals and dates are extensively cultivated, the latter being exported in large quantities. Little attention is devoted to mineral resources, although coal, iron and lead are to be found. There is a flourishing native industry in embroidery and pottery.

Three races occupy the area: Pathans, Brahuys in the middle district, and Baluchis in the South. At the 1931 census the number of Mohammedans was 798,093. Justice is administered principally by ancient tribal law. There are only some 840 m of good road, and 900 of railways. The postal and telegraphic services are

adequate Regular troops are quartered in various districts

After the Afghan War of 1878-81 five districts were handed over to the British who in 1887 incorporated them as British Baluchistan Further additions were made chiefly by occupation between 1886 and 1903 Area c 134 640 sq m pop 868 617

**Balzac** [BAL ZAK] Honoré de (1799-1850) French novelist was trained to the law which he practised for a short time His desertion of this profession led him to try his hand at writing to save himself from starvation and many of his early novels (mostly imitations of the Gothic tale of terror as practised in England by Mrs Radcliffe and Monk Lewis) were published with varying success The first of his great novels *Les Chouans* was written in the country whither he had fled to escape the debts occasioned by the failure in 1819 of his first business venture a printing firm This work was a colourful imitation of Scott

The next 40 years saw the production of 83 novels an ample testimonial to his fertility and energy In 1840 he proposed the collection of these works and the writing of more to form *La Comédie Humaine* this was to cover all the scenes of life—in Paris in private in the army in the country etc etc This project could never be completed and he died in 1850 the friend of nearly all the great French literary figures of the time of whom one Victor Hugo delivered his funeral oration

It may be said that the life long pressure of debt (as with Scott) and his love for three high born ladies especially for Mme Hanska whom he married just before he died urged on and inspired him in his great work He exceeds Dickens in his attention to detail and his conception of character is greater and wider than that of any other novelist

Of his works several must be mentioned *La Femme de Trente Ans* (1831) *La Peau de Chagrin* (1831)

*Ingénieurs Grandet* (1833) *Père Coriot* (1834) *Les Illusions Perdues* (1834)

**Bamberg** Bavarian town c 40 m N of Nuremberg Local manufactures include textiles on a large scale leather work and rope-making There is a considerable trade in the market garden produce of the district The cathedral was founded in the 11th cent by King Henry II the German emperor whose tomb is there There are several other ancient churches and the old palace s of interest Pop (1955) 50 150

**Bambino** term used in Christian Art to denote a swaddled figure representing the Infant Jesus

**Bamboo**, trees or shrubs belonging to the tribe Bambuse of the grass family They have been well described as arborescent grasses and the larger species form extensive groves in the tropics while smaller forms grow in the shade of primitive forests Most of the species are Asiatic others grow in S America and a few in Africa Some will grow out-of-doors in England if planted in a rich loam and given much manure and water

The stems are woody and spring in large numbers from an underground rootstock They are hollow with well marked nodes and diaphragms within the nodes The leaves are long and narrow and the flowers are borne in large inflorescences

The stems furnish a convenient building material and the hollow internodes serve for all kinds of household utensils The stems of some species contain much silica and are used for whetstones or to give cutting edges The young stems with a soft and succulent are boiled and eaten like asparagus or preserved in salt or sugar or pickled The grains are eaten in the East

**Bamburgh** (or *Bamborough*) maritime village of Northumberland chiefly notable for its ancient castle and as the birthplace of Grace Darling Between the Norman Conquest and the 15th cent Bamburgh was a considerable town and coal and lead

were mined in the neighbourhood. It is now a fishing village and holiday resort Pop c 1000

**Bampton, John** (1689 ?-1751), English divine, founder of the Bampton lectures, was canon of Salisbury Cathedral from 1718. He left £120 to endow the lectures, which must be delivered by an M.A. of Oxford or Cambridge, and printed within two months. They are given in alternate years, and are based, according to the provisions of the will, on the Scriptures and the early Fathers, on the divinity of Jesus Christ and the Holy Ghost, and on the Apostles' and Nicene Creeds.

**Ban**, a proclamation or edict. The word is found in many languages, generally in connection with a prohibition, e.g. banishment. In England it is also used to denote the proclamation of intended marriages, i.e. publishing the Banns (see MARRIAGE).

**Banana**, the fruit of species of the monocotyledonous genus *Musa*. The plants consist of great spurious stems, formed of sheathing leaf bases bearing giant leaves, growing at intervals from subterranean root-stocks. True stems are produced at flowering time, and make their way up through the leaf bases to carry a great flowering branch to the light. The flowers have their parts in threes, and are inconspicuous but are borne in the axils of large, often brightly coloured, bracts. The fruits are a valuable food, especially in tropical countries.

**Banat**, formerly part of S Hungary, was divided by the Peace Treaty (1919) between Yugoslavia and Rumania. There has always been a medley of races, with no dominating racial grouping. The vast majority of the territory has gone to Yugoslavia. It is a country of corn and wine, with fertile plains, the two chief towns being Temesvár and Caransebeș.

**Banbury**, Oxfordshire town on the R. Cherwell, of very ancient foundation, and the scene of a battle in the 6th cent. The famous Banbury Cross of the nursery rhyme was destroyed by the Puritans. Local industries

include the making of agricultural machinery and implements, brewing, and leather work. An important cattle market is held. Pop 13,953.

**Bancroft, Richard** (1544-1610), Bishop of London in 1597, and Archbishop of Canterbury in 1604. He directed the case against "Martin Mar-Prelate," and was a member of the Hampton Court Conference (1604). Bancroft supervised the authorised version of the Bible.

**Bancroft, Sir Squire** (1841-1926), actor-manager, of the Prince of Wales Theatre, London (with Miss Wilton, whom he married, 1867-80), and of the Haymarket (1880-5). Bancroft was successful in many plays, notably *Diplomacy*, which has recently been revived, forty years after his command performance at Balmoral (1893).

**Band**: (1) Orchestra (*q.v.*) (2) Collection of instrumental musicians in the form of

(a) A brass band, consisting of 24 members equipped with instruments of the Saxhorn family, which include soprano cornet in E flat, cornet in B flat, tenor-horn in E flat, baritone B flat, euphonium in B flat; bombardon in E flat, and contra-bass bombardon in B flat. These may be augmented by 3 slide trombones.

(b) A military band consisting of wind instruments, both brass and wood, with occasionally the addition of a double-bass, e.g. flutes, piccolos, clarinets, oboes, saxophones, bassoons, cornets, trumpets, French horns, tenor and bass trombones, euphoniums, bombardons, side-drums, bass-drum, and cymbals. There are thousands of brass bands in the British Isles, among many of which keen rivalry exists, manifested by the various competitions held throughout the country, especially at the Manchester and Crystal Palace annual contests. Among the crack bands are those of the St. Hilda Colliery and the Black Dyke Mills. The first military bands in Great Britain are those of the Brigade of Guards, the Grenadier Guards' Band being one of the best-

known In the summer of 1933 this band visited Paris where it gave several performances

(c) A jazz (q v) dance band which employs violins banjos clarinets saxophones trombones trumpets and piano in combination Two of the earliest jazz bands were the Savoy Orpheans and the Savoy Havana Band Paul Whiteman's huge jazz band of over a hundred players made England familiar with the new symphonic syncopation and demonstrated virtuosity in individual instrumentalists The British band conducted by Jack Hylton has been most successful abroad

**Banda Islands** group of small hilly islands in the Banda Sea Dutch E. Indies The soil which is of a volcanic nature is fertile and especially suited to the production of nutmegs which form the chief export Other crops are coconuts fruit and vanilla Most of the natives are of Javanese descent and there are many Chinese and Arab traders The islands were discovered by the Portuguese in the early 16th cent fell to the Dutch in the 17th, held by the British in the Napoleonic War and returned at its termination Area 20 sq m pop estimated 10 500

**Bandana**, a large square or handkerchief made of silk or cotton which is dyed generally red or yellow and then has a white pattern of spots or diamonds bleached on to it The best known variety of bandana is the coarse square of red cotton with large white spots worn as a head-dress by negro women cotton workers and also popular until recently as a *choke* or food-carrier for London costermongers

**Bandar Abbas**, S Persian port on the Strait of Hormuz The harbourage is not good but a considerable yearly trade is done The main exports are carpets cotton and fruit and imports include many kinds of manufactured goods Bandar Abbas was for some time the principal port of the country but has been superseded by Bushire Pop c 10 00

**Bandello Matteo** (1490 ?-1561) Italian writer Bishop of Agen (1550) followed Boccaccio in his collection of 214 *novelle* (tales) of which Fenton's English version appeared in 1567 Many works (among them some of Shakespeare's) have been based on these tales which a good style and clear characterisation render second only to the *Decameron*

**Bandicoot** an animal related to the kangaroos and other marsupials (q v) in having a pouch for its young The



B andicoot

various species inhabiting Australia Tasmania and New Guinea are about the size of a rabbit have pointed snouts and are mostly insect-eaters

**Banditti**, originally small bands of irregular troops but in modern days brigands and outlaws living by robbery and rapine Brigands are usually recruited from suppressed and discontented minorities or from remnants of a conquered people carrying on guerrilla warfare against the new régime Strong central and provincial Governments stamped out banditry in most parts of Europe by the end of the 18th cent but it persisted until recently in Spain Corsica and in Sicily where it was highly organised as the *Mafia* which was finally suppressed by the Mussolini administration

**Band of Hope**, an English society founded in 1855 for the inculcation in children of principles of sobriety and temperance It has tens of thousands of branches and a membership of nearly three millions

**Band Saw** a machine saw chiefly used

of steel running over two pulleys, and having saw teeth cut in one of its edges. It is used for sawing planks from logs, and for general wood-working practice.

**Banffshire**, a Scottish county situated on the NE coast between Morayshire on the W and Aberdeenshire on the E, and stretching inland to the neighbourhood of the Cairngorm plateau. The S part of the county is mountainous, culminating in Cairngorm (4085 ft). The N is rolling lowland. The chief rivers are the Spey and Deveron. The lowlands and glens are fertile, and intensive agriculture is conducted, oats, barley, some wheat, and root crops being grown. Dairy farming and stock-raising are practised. Both the sea and freshwater fisheries are important, the rivers are celebrated for their trout and salmon, and the towns and villages on the Moray Firth carry on a large trade in cod and herring. Cairngorms, gems of crystallised quartz, are found among the S mountains. Distilling and boat-building are the main industries. Banff (4140), Aulickie (8700), Keith (6100), Macduff (280), and Portsoy (1650) are the chief towns. There is an interesting historical monument at Cullen recalling the decisive defeat of Scandinavian invaders early in the 11th cent. Area, 640 sq m, pop (1931) 54 830.

**Bangalore**, capital of Mysore (*qv*), India, a large British military centre. There are considerable local industries, including cotton, silk, and woollen mills, ironworks, and distilleries. Bangalore is a big railway centre, and has several fine public buildings, including the Maharajah's palace, and the Institute of Science. The town was in British hands from 1831 to 1881, when the ruler of Mysore was reinstated. Pop (1931) 306,500.

**Bangkok**, capital and principal port of Siam, situated on the Me Nam R., a few m from its mouth. The principal exports are rice, tea, and timber, and important local industries are rice-milling, boat-building, and saw-milling. Imports include silk, textiles, and

manufactured goods. Three-quarters of the trade of the whole country passes through Bangkok. The city has been modernised by good roads, modern buildings, and sanitation. It became the Siamese capital late in the 18th cent. Pop (1924) 453,000 (1600 Europeans).

**Bangor**: (1) Welsh town of Carnarvonshire on the Menai Straits, with a cathedral, parts of which are very ancient. The grammar school dates from the 16th cent. The chief local industry is slate-quarrying. Pop. 10,959. (2) Irish town in co. Down, on the S bank of Belfast Lough, a popular watering-place, with manufactures of linen and cotton goods.

**Bangweolo** [BANGWEOLŌ], lake of N Rhodesia, into which the Upper Congo flows. It is surrounded by swamps, through which the Chamberlain R. passes. There are several marshy islands in the lake, which is shallow. The largest space of open water is c. 60 m N to S and c. 40 m E to W. Bangweolo was discovered by Livingstone in 1868.

**Banjo**, a stringed instrument, probably of African origin. It has a circular body over which parchment is stretched, and a long neck. The number of strings varies from 5 to 7. It is played by plucking the strings.

**Bank Charter Act**, see **BANK OF ENGLAND**.

**Bank for International Settlements**, bank established in 1930 under the Young Plan (*qv*) to facilitate the transfer of reparation payments. It is the bank of the central banks of 20 countries, 24 of which are European. The other two are Japan and the United States.

**Organisation**. The Bank for International Settlements is a share company situated in Basle, incorporated, with a charter for 15 years, under a special Act of the Swiss Government, embodying a treaty between Switzerland and the countries concerned with the Young Plan Agreement. Its authorised capital is 500 million Swiss francs.

2500 francs each) The shares are issued with 25 per cent. paid up The total of the shares have been issued being allotted to the central banks of the 26 countries (except in the case of the United States where the Government refused to allow the Federal Reserve System to be associated with the bank, and where a group consisting of J P Morgan & Co the First National Bank of New York and the First National Bank of Chicago took 16 000 shares and appointed a representative) Though the shares may be sold to private interests they do not carry voting power which rests with the central banks (or in the United States the group mentioned above) Most of the shares are held by reparations-receiving countries

The administration of the Bank for International Settlements is entrusted to representatives of the central bank who meet as the Board of the Bank for International Settlements 10 times a year The representatives are the governors or nominees of the central banks of Belgium France Germany Great Britain Italy and the group of United States banks together with 1 representative of each of those countries also appointed by the central bank Governor concerned who are representative of finance industry and commerce plus 1 additional French and 1 German member also 9 further members representing the remaining 19 central banks This arrangement gives the reparations-receiving countries a majority of 13

*Purpose* The Bank for International Settlements was designed to be a non political body dealing with Governments only through the central banks (qv) It was needed because the collection and transfer of reparations (qv) was under the Young Plan put into the hands of Germany (whereas it had under the Dawes Plan been controlled by various committees headed by the Agent-General for Reparations) The transfer of the large sums involved in reparations payments had been found to present considerable difficulties

creating disturbances to the exchange and money markets of the receiving as well as the paying countries (see TRANSFER PROBLEM GOLD STANDARD) An international agency was needed which should have the knowledge and the skill to operate so as to minimise such disturbances and should be as non political in character as possible

*Other possibilities of the Bank for International Settlements* Apart from the reparations function of the Bank for International Settlements three important possibilities of future development have been much discussed These have now become of greater interest since reparation payments were virtually ended by the Lausanne Agreement (reached in the summer of 1932) They are

(1) A foreign exchange clearing system

(2) A central gold reserve

(3) Price stabilisation

(1) is a function which actually developed to a considerable extent in the handling of reparations since the bulk of these payments were eventually transferred in the form of war debt instalments by the reparations receiving countries to Great Britain and the United States—chiefly of course the latter Since the cessation of reparations this branch of activity has been considerably lessened

(2) has not been undertaken The theory is that such a reserve claims to portions of which could be transferred from one central bank to another by mere book keeping entries would eliminate much of the expensive and wasteful shipment of gold back and forth between the different centres Some economists suggest that this would derange the working of the gold standard (qv) because exchanges would no longer move between gold points and gold shipments would not have their corrective effect on trade balances The corrective effect could however be maintained if instead of watching actual gold shipments as an indication of equilibrium in trade

balances, the gold reserves of central banks at the Bank for International Settlements were watched, and the credit and monetary policy of central banks managed accordingly. The chief difficulty in the way of the development of this idea up to the present lies in the reluctance of central banks to keep part of their gold reserves with the Bank for International Settlements. The Bank for Inter-



Tallulah Bankhead

national Settlements takes deposits (not in gold) of central banks, utilising these funds in liquid investments such as short-term loans, bills of exchange, treasury notes, and deposits in foreign centres, etc.

(3) is definitely controversial, the desirability of price stabilisation by monetary means being far from universally agreed upon. Especially in view of the fact that a considerable part of the world is now off the gold standard, this question is likely to remain, for some time, purely academic, so far as the Bank for International Settlements is concerned.

The Bank for International Settlements offered suggestions regarding world currency to the World Economic Conference in London in the summer of 1933, advocating a return to the gold standard.

**Bankhead, Tallulah** (b. 1902), American actress. She made her debut at the age of 16, and came to London 5 years later, where she made a number of highly successful appearances in *Her Cardboard Lover*, *The Lady of the Camellias*, and other plays. Her acting, voice, and appearance made her so popular that she was given a Hollywood contract, and made *Tarishi Lady*, *The Devil and the Deep*, *Thunder Below*, and *My Sin*. On the whole, her films were less successful than her stage appearances. In 1933 she received fresh offers from Hollywood and from the New York theatres.

**Bank Holidays**, weekdays on which banks must by law be closed, established by an Act of Parliament introduced in 1871 by Sir John Lubbock (Lord Avebury). In England and Northern Ireland they are: Easter Monday, Whit-Monday, the 1st Monday in August, and the first weekday after Christmas (Boxing Day). In the Irish Free State March 17 (St. Patrick's Day) is also a bank holiday. In Scotland, Christmas Day, the first weekday of the New Year, Good Friday, and the 1st Monday of May and August. The various States of the U.S.A. observe bank holidays on different dates.

**Banking and Credit.** Banking business is fundamentally similar to any other form of commercial business, though on the surface it looks very different. The dealer in leather buys leather from many producers and sells it to many users—he constitutes a meeting-place where buyers know they can get leather without travelling about to collect it from many makers, and where producers know they can sell their leather without getting personally into touch with countless users. The banker, though he does not actually buy money (unless he is dealing in foreign exchange, in which

case he is even more like the ordinary commodity merchant) buys and sells rather the use of money the price being represented by the rate of interest. Countless depositors place their money with a banker receiving a small rate of interest on it while a number of borrowers hire the use of these deposited funds at rates of interest a little higher. But there is one great difference between the ordinary merchant and the banker. The banker not only *deals in the use of money* but he also *provides facilities for the making of payments*. A great step forward was taken when in place of barter a system of money exchange came into being (see MONEY). The development of banking has taken another equally important step in providing the most convenient media of exchange—the cheque and the bill of exchange. The provision of credit is their great contribution to the economic system of to-day as is the business of bankers as dealers in the use of money.

**Early History** The early continental banks such as the Bank of Antwerp and the Bank of Hamburg were exchange banks and not credit banks of the kind that exist to-day. The service they rendered was rather more like that of the expert dealer in a commodity which varies in quality and which needs to be carefully weighed and measured sorted out and priced for the convenience of both buyers and sellers. In the Middle Ages coinage was very variable not only as between that of one country and another but also within the single country. Coins were often sweated and debased and it took an expert to estimate the accurate value of a bag of coins offered for payment in a given transaction. The early banks performed this service taking in coin of every description assaying and weighing it and issuing bank money or *Marc Banco* which represented a given weight of silver. This bank money became the medium of exchange in foreign trade and played

an important part in developing trade during the 17th and 18th cents. When coinage became more scientifically managed by the State and as other forms of banking developed these banks gradually disappeared. It is notable that the last to survive was the Bank of Hamburg which was finally deprived of the greater part of its business when the miscellaneous silver coinages of the several German States and Principalities were replaced in 1870 by a gold standard currency after the formation of a united German nation.

These banks were merely foreign exchange dealers who issued a medium of exchange which could circulate in many countries. The bank money might be looked upon as a sort of early

bank note but it had a very important difference. The Bank of Hamburg and other similar institutions had no need of capital or deposits to provide them with funds and a stock in trade. They paid out the amount they received. This business was essentially different from *deposit banking* the development of which will now be examined.

**Deposit Banking** Probably the earliest deposit banking was carried on in Venice about the beginning of the 14th cent. by a bank which also dealt in foreign exchange. Some of the other banks such as the Bank of Hamburg also did some deposit business. In England it began with the deposit of bullion and coins by wealthy people with goldsmiths for safe keeping. Landlords who received their rents on quarter day or merchants receiving large payments for transactions did not wish to keep the whole amount at home until they used it. It might be stolen and was cumbersome to carry. They formed the habit of taking their gold and silver to a goldsmith who had vaults where large amounts could be locked away in safety. The goldsmith naturally gave a receipt to the owner which being merely a piece of paper was carried about and was co



safe, because it had the owner's name on it. If the owner happened to want to make a payment of the same amount to someone else, he might make the receipt over to him, which would be readily acceptable, because the taker would know that it stood for the valuable metal. But this was not very convenient, because he would probably not want to pay out his whole quarter's income in any one payment. Goldsmiths then conceived the idea of giving receipts for different amounts totalling the whole deposit. These receipts were practically bank-notes as they are known to-day, though different in appearance. Such notes could circulate as money, because the goldsmith whose name they bore was well known, and they were actually receipts for so much gold or silver.

Up to this point the goldsmith had merely provided a less bulky medium of exchange and the service of keeping the depositor's gold and silver safe until he wanted to withdraw it. The next step was in the direction of the actual creation of credit. The goldsmith found that his depositors did not call for all their gold at once, and that he could safely lend part of it to traders who wanted funds to buy goods to be sold later, or to send produce from one place to another for sale. He therefore began to lend a part of the money entrusted to him at interest, keeping in his safe only enough to meet withdrawals by the owners. The more his notes (or split-up receipts) circulated, the longer the coin was left with him, and the more of it he could lend out. This proved profitable enough to allow him to pay a low rate of interest to depositors to encourage them to bring their coin and leave it with him longer.

The next step was quite as important as the first two described above. The goldsmith who thought of the idea of lending not the gold and silver coin deposited, but notes such as those he gave his depositors, hit upon the modern bank-note.

Thus the goldsmith—or the banker, as he can now be called—could hold, say, £20,000 in gold and silver coin, giving notes to that amount to his depositors, and lend, say, another £80,000 in notes to merchants, whom he trusted to repay the loans at fixed dates. He then would owe his depositors £20,000, which he would pay in coin when they demanded it. He would also owe another £80,000 to the various people who took his notes from his customers, in payment for various transactions. He would have in his vaults only £20,000, together with £80,000 owed to him by those who had borrowed from him. If a substantial number of the holders of his notes called for coin all at once, he would not be able to pay immediately, and his reputation would be impaired. In fact, the amounts given above as an example would probably have been safe enough, because note holders did not often call for coin—but if the goldsmith or banker went on issuing notes against merchants' promises to pay with too optimistic an expectation of possible calls upon him, he would end in disaster, which would involve those persons who had believed in his good name sufficiently to accept his notes in payment for goods or services. As a matter of fact, these disasters were so frequent in the early days of banking that the Government began to take steps to regulate the issue of bank notes. These regulations were so drastic that finally the Bank of England obtained the monopoly of bank-note issue in England and Wales, and even the uncovered issue of that institution was restricted to £14 millions, against which government securities had to be held, while all other notes had to have behind them gold to their full amount (see FIDUCIARY ISSUE). Though some of the country banks continued to issue notes for some time, the importance of note issues in the business of each bank diminished, while in London the Bank of England held a practical monopoly after 1844. The legislation of the time was in the

direction of limiting the amount of bank notes issued in England and Wales whereas in Ireland and Scotland regulation as to the security which should lie behind them was more stressed. Issues are limited today in both those countries whilst in England and Wales the Bank of England is the sole issuing bank.

*The Cheque* When the right to issue bank notes was virtually taken away from joint-stock banks (*q.v.*) and when in London private banks with unlimited liability had practically ceased issuing notes it was thought that banking business would die out since the issue of notes was considered the real source of profit. But meanwhile a new instrument the cheque (or draft) had begun to come into use and because of its greater convenience and safety rapidly developed after the restriction of note issues by bankers. In spite of the fact that cheques cannot from their very nature be legal tender and that they necessitate a greater degree of trust in the drawer as well as in his bank, they are the most widely used means of payment to-day.

A cheque is simply an order to pay a named person or institution a named sum of money from the deposits of the drawer in the bank on which the cheque is drawn. It may be written on a piece of note paper but is usually written on a printed form supplied for that purpose. A person accepting a cheque in payment for a transaction must believe that the drawer of the cheque really has an account sufficient to pay the cheque in the bank on which it is drawn.

A cheque is by far the most convenient medium of exchange because it can be made out to the exact amount to be paid and because if stolen it is not readily negotiable (*q.v.*). If made out to bearer however it more resembles a bank note since it can be cashed by anyone in possession of it at the bank on which it is drawn.

*Modern Banking* Thus by the use of cheques banks could continue

to lend to merchants and others though deprived of the right to issue notes for they could lend the right to draw cheques on them. The bank's loan then became a book entry on which the borrower had the right to draw cheques and the bank created credit in much the same way as it did when it issued notes. As soon as the borrower paid out some of his borrowed funds to another those funds (in the same or in another bank) became *deposits*.

*Cash Ratio* The banker must still however observe the same prudence in lending as he would in issuing notes—he must always keep enough cash in hand or in his account at the Bank of England to meet any reasonable demand for cash. In some countries the proportion of deposits to cash is regulated by law—e.g. the United States—but in England there is no statutory regulation. British banks generally keep this proportion at around 10 per cent which they find in practice sufficient both to meet the demands made on them and at the same time to command the confidence of their depositors.

*Second Line of Defence* Not only do they keep 10 per cent of their deposits in cash in their tills and at the Bank of England earning no interest and readily available but they also keep a certain proportion of their deposits in loans which can quickly be called in. The loans made to persons who are able to repay quickly are generally called the banks' "second line of defence".

In British banking these loans are made to the *discount market*. This is the market in bills of exchange which are bills drawn by sellers on buyers of goods and accepted by the latter as due for payment by them on a certain date (usually 3 months after delivery of goods or after acceptance). Such a bill represents future money and provided the names of both merchants are reputable it can be sold for its value less 3 months interest at current market rate. If

it can be "discounted." To buy (or discount) such bills, bill-brokers and discount houses need ready funds. These funds they borrow from the deposit banks to be repaid on call, or at short notice. If such calls from the banks are heavy, they may have to replenish their funds by borrowing from the Bank of England. Thus they do by taking their best bills to the Bank of England, where they can be rediscounted at (or sometimes slightly above) the *bank rate*. The bank rate, therefore, is the one at which the Bank of England rediscounts bills for the discount houses. When discount houses are obliged to borrow from the Bank of England, as a last resource, the market is said to be "in the Bank." Normally, the discount market refrains from resorting to the Bank of England, since the bank rate is always slightly higher than the rate at which they can borrow from the commercial banks. But for short periods the discount market sometimes has to go to the Bank of England when trade is active and funds are in demand, or when the banks are calling in loans for special purposes, e.g. for the payment of taxes or at the end of the year, when they are *window dressing* (i.e. making a good showing for the publication of the balance sheet).

*Advances and Overdrafts* Besides its second line of defence, the banker is constantly making other loans for short periods, that are always being repaid. These are chiefly advances or overdrafts to customers for purposes of carrying on their business. They may be loaned, as in most cases, on security, such as Government or other easily saleable stock exchange securities—or they may be lent just on the good name of the borrower. The purpose for which the loan is made is the important thing to the banker, because on it depends the surety of repayment, and the possibility of calling it in at short notice. British bankers, on principle, lend funds to industrial and commercial customers only when they are to be used for

"working capital," e.g. for buying raw materials to be made into saleable goods—or for goods to be bought for reselling. They do not lend capital to industrial firms for buying machinery or building factories or other plant, because such funds would be tied up for too long a period, and bankers would not feel sure of getting fairly quick repayment of their loans. Thus they must be sure of to keep their own condition sufficiently liquid to permit them to meet the demands of their depositors. For the same reason British banks do not lend on mortgage, or real estate security, because they do not consider real estate assets liquid enough for their purposes—it is not easy enough to sell quickly for ready cash. German banks lend to a considerable extent for long-term capital purposes, and American banks often lend on mortgages, but British bankers consider that their strength lies largely in the fact that they leave both these types of loans to other institutions, such as *finance companies* and *issuing houses* (q.v.), which form part of the *capital market*, and to *building societies* and *insurance companies* which specialise in advancing loans on mortgages.

*Bill Portfolio and Acceptances.* Modern deposit, or joint-stock, banks also do a certain amount of business in discounting, and accepting bills for their customers. (See *BILLS OF EXCHANGE*.) They also keep a fair amount of their funds invested in gilt edged securities. These carry only a small rate of earnings, but are readily saleable.

*Rates of Interest earned by Banks.* The most remunerative use of a bank's funds is in advances to customers, for which they usually charge 1 per cent over bank rate, with a minimum of 5 per cent. The rate they receive from their money at call and short notice is fixed by agreement between the banks, and is varied from time to time as market conditions change. It may be 1 per cent—during the last half of 1932 and 1933—or it may be as high as 4 or 5 per cent.

per cent. It is usually 2 per cent below bank rate so that it is always considerably lower than the rate for advances. The banks also carry bills of exchange and *Treasury Bills* (*qv*) in their portfolios. The interest they earn on these varies according to the state of the money market and that for Treasury Bills for example may be as high as  $\text{£}5\ 1\text{s}\ 2\ 9\text{d}$  per  $\text{£}100$  as in Dec. 1931 or as low as  $8\text{s}\ 8\ 1\text{d}$  per  $\text{£}100$  as on May 1 1933.

*Rates paid by Bank on Deposits.* The above are the principal rates of interest earned by banks for the use of the funds they lend. The rate they pay to depositors varies when the rates they can earn vary. On Sept. 24 1931 for example when the call money rate was 4 per cent and Treasury Bill rates were around  $\text{£}5\ 1\text{s}\ 9\ 2\text{d}$  (or  $5\ 13$  per cent) they were paying depositors 4 per cent in 1932 and 1933 when these rates were 1 per cent and between  $17\text{s}\ 1\text{d}$  and  $7\text{s}\ 8\text{d}$  respectively they paid depositors only  $\frac{1}{2}$  per cent.

Banks do not pay interest on "current accounts" on which depositors have the right to draw cheques without notice. In fact they often charge the depositors a small sum for the service of keeping an account for them and paying their cheques for many persons who deal with a bank leave so little money in their accounts and leave small balances for such a short time that they actually contribute practically nothing to the fund of loanable deposits while they cause considerable work by drawing many small cheques. It is only on deposit accounts—which can only be withdrawn at so many days' notice that interest is paid. About half the deposits of the large English banks represent "current accounts" and about half "deposit accounts."

*Clearing House.* The chief reason for the rapid growth in the use of cheques was their convenience to traders while one of the chief results was the increase in the means of payment without a similar increase in gold

stocks. This was due to the fact that a great mass of payments could be made by cheque which would largely cancel out and could therefore be paid without the movement of gold coin or other legal tender. Payment between two persons with accounts in the same bank could be effected by cheque and a mere book-keeping entry by the bank. Payments from persons with an account in one bank to a person in another would usually be largely cancelled by similar payments in the other direction and only the margin of difference would have to pass from one bank to another. To facilitate the payments between banks employees of the banks soon formed the habit of meeting at a given place at a certain hour of the day to exchange the cheques drawn on each other after which any balance due to one bank by another would be paid. This meeting place developed into the Clearing House to which each of the participating banks sends its messenger daily. Here cheques are exchanged the total due to be paid to and from each bank is added up and the differences are adjusted each day by a book-keeping entry in the accounts of the banks with the Bank of England. The London Clearing House clears all London cheques and all country cheques on or from London banks. There are 12 clearing houses in the provinces for local clearings. Statistics of clearings are published regularly and indicate in a rough way the trend of total payments being made. They do not show payments between customers of the same bank however and are thus incomplete as a measure of total payments. The Board of Trade early in 1931 started publishing a new set of figures giving total debits to all accounts in all the larger banks which are more complete as a measure of business done. It should also be noted that the London figures show "Town,

Metropolitan and Country clearings separately. This is done because the Town clearings are roughly those for financial and stock

exchange business, whereas the remainder represent more purely commercial and industrial transactions

LONDON BANKERS' CLEARING HOUSE—  
TABLE OF CLEARINGS, Millions of £

	Town *	Metropolitan,† Country and Provincial	Total
1924	113.8	20.7	134.5
1929	130.1	21.4	151.5
1931	103.6	18.3	121.9
1932	90.4	17.9	108.3

\* Chiefly Stock Exchange and other financial transactions

† Chiefly trade and industrial transactions

#### Amalgamations of British Banks

In 1792 there were about 350 banks, and in 1840, 647 banks. By 1890 the number was reduced to 104. To-day there are 16 deposit banks in Great Britain, dominated by the "Big Five," namely, the Midland, Westminster, Lloyds, Barclays and the National Provincial Bank. Martins Bank, after its amalgamation with the Lancashire and Yorkshire Bank in 1928, is now large enough almost to be included in a "big six"—though it is considerably smaller than any of the big five. There are ten clearing banks in London—*i.e.* banks belonging to the Clearing House. They are the big five, Martins, the National Bank

(Irish), Glyn, Mills & Co, Coutts & Co and Williams Deacon's Bank, Ltd.

They publish monthly balance sheets. The important items as at Dec 31, 1932, for each of the London clearing banks are given below.

Besides the 10 clearing banks there are Baring Brothers, The London Merchant Bank, in London, and The District Bank, the Manchester and County Bank, the Union Bank of Manchester, in the North of England.

The big five have branches throughout the country, the Midland having 2103 branches, Westminster 1073, Barclays 2070, Lloyds 1924; and the National Provincial 1371, there are 1 Scottish Banks and 3 Northern Ireland banks. There are also 4 private banks.

The discount houses mentioned in a previous paragraph are Alexanders, the National Discount Company, and the Union Discount Company of London.

*The Pyramid of Credit.* The importance of the cheque in the development of modern business becomes evident when it is realised that, because the cheque system allows the greater part of transactions to cancel out without the use of money, it makes possible a far larger volume of business with a given amount of cash than could otherwise be carried on. This,

ASSETS AND LIABILITIES OF THE TEN LONDON CLEARING BANKS—DEC 31, 1932  
Millions of £

	Liabilities		Assets				
	Current, Deposit and other Accounts		Cash and Balances with Bank of England	Money at Call and Short Notice	Bills Discounted	Loans and Advances	Investments
	Current	Deposit					
Barclays	12.4	381.8	62.3	24.8	66.3	153.2	94.0
Lloyds	46.9	382.1	54.5	26.6	76.8	152.2	90.1
Midland	13.1	419.3	43.6	34.9	86.5	170.2	101.1
National Provincial	24.4	291.8	39.9	17.7	58.9	122.2	64.1
Westminster	40.2	248.2	41.1	21.1	66.9	105.7	75.2
Coutts & Co.	2.6	20.1	2.9	1.8	3.7	7.1	6.0
Williams Deacon's	5.0	23.8	5.9	4.8	3.6	11.4	9.7
Glyn Mills	3.6	25.7	7.1	6.5	8	10.3	11.5
Martins Bank	12.3	85.8	12.6	6.2	10.5	30.6	50.5
National Bank (Irish)	4.0	32.1	3.9	5.0	1.8	14.5	17.0

quite apart from the convenience and the safety of the cheque. The provision of credit to traders and manufacturers is of vast importance to the whole modern economic system.

The amount of credit that can be given by cheque rests in the last analysis upon available cash—or the *basis of credit*. The credit structure has been likened to an inverted pyramid resting on a base of cash. When for reasons of panic war fears etc. a large proportion of claims for cash are presented banks often find themselves unable to meet all the demands on them because they cannot recover quickly enough the amounts they have lent. *See also* CENTRAL BANKS. BANK OF ENGLAND. MONEY MARKET. MONEY.

Bank note *see* MONEY. BANKING AND CREDIT. BANK OF ENGLAND.

Bank of England, the central bank of the United Kingdom *see* the Bank of the British Government the Bank of

the commercial banks of the country and the keeper of the gold reserves.

The Bank of England was founded in 1694 for the purpose of raising a loan of £1 00 000 for William III. It was an association of merchants incorporated by Act of Parliament and was the first joint stock bank in the country. It was given certain privileges: it became the Government's bank and later took charge of the issue of government loans and the national debt generally. When its charter was renewed in 1709 it was provided that the Bank of England should be the only joint stock bank—the only bank the capital of which is subscribed by shareholders—or more precisely the only bank with more than 6 (or after 1862 more than 10) partners. It was given the sole right to issue bank notes in England and Wales. In 1866 joint-stock banks situated 60 m. from London were permitted to issue notes but this privilege was gradually



Bank of England.

revoked after 1844, under the provisions of the Bank Charter Act of that year, so that to-day, with the exception of note issues by private banks amounting to c £500,000, and the issues of Scottish banks, the Bank of England has a monopoly of note issue in Great Britain (*see* BANKING AND CREDIT, GOLD STANDARD)

After 1833 joint-stock banks were allowed to be formed in London, but without the privilege of note issue. By the Act of that year Bank of England notes were made *legal tender* everywhere except at the Bank of England itself, which had to pay in gold if demanded.

The system on which the Bank of England works to-day was laid down in the Bank Charter Act of 1844, the principal provisions of which were

(1) The division of the bank into two departments—the Issue Department and the Banking Department. This is a feature which is not common to Central Banks (*qv*) in other countries.

(2) A compulsory weekly return of both departments. The form of this return remained unchanged until 1928, when slight additional information was added.

The Banking Department acts as banker to the Government and to the other banks of the country, the conduct of the business of this department being left to the discretion of the governor and the directors.

The principle of management of the Issue Department was most strictly defined. The *fiduciary issue* (*qv*), i.e. the amount of notes issuable without an equivalent gold reserve, was restricted to £14 millions (which increased gradually, as country banks lost their right of issue, to £19,750,000 where it stood in 1928). In 1928 the *Treasury Notes* (*qv.*) issued by the Government during the World War were taken over by the Bank of England and the fiduciary issue was increased to £260 millions.

The fiduciary issue must be backed by Government securities.

The principal features of the Bank of England's working to-day, apart from the management of the note issue, are as follows:

As the Bankers' bank, the Bank of England takes deposits from the banks, on which it pays no interest. These deposits are regarded as cash by the commercial banks, because they can always be drawn out immediately when needed. (When the country is on the Gold Standard (*qv*) they can be drawn out in gold.)

The Bank of England also discounts bills at a fixed published rate of interest known as the Bank Rate (*qv.*), this acting as a reserve of credit when there is a scarcity for one reason or another.

By selling securities in the open market the Bank of England can contract the amount of funds in the market, because institutions buying the securities pay the Bank of England for them, thus putting out of the market and into the Bank of England the amount thus paid. Conversely, the Bank of England can expand the funds in the money market by buying securities. Such buying and selling of securities by the bank is known as *open-market operations*, and it and the Bank Rate are the two forces by which the Bank of England controls the money market.

The Bank of England, though a private and not a Government institution, and though earning dividends for its shareholders, conducts its business primarily with a view to serving the interests of the country, according to the opinion of those interests held by the governor and the directors.

The central bank of any country must think, not only of the internal needs of industry and trade for credit, but also of the position of the country's currency in relation to that of other countries. There may be a need for an expansion of credit and low interest rates for industry within the country, and at the same time the need of a high bank rate for purposes of maintaining the gold





revoked after 1844, under the provisions of the Bank Charter Act of that year, so that to-day, with the exception of note issues by private banks amounting to c £600,000, and the issues of Scottish banks, the Bank of England has a monopoly of note issue in Great Britain (see *BANKING AND CREDIT, GOLD STANDARD*)

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reserves (*see* GOLD STANDARD) This was the situation through most of the period 1920-31 a fact which made the task of the Bank of England particularly difficult At times when a boom in business and speculation is going too far the central bank by raising the bank rate can put a check on the tendency This was done for instance in 1911 in England

Since the suspension of the gold standard the *Exchange Equalisation Account* (*q.v.*) has been managed by the Bank of England

A specimen weekly statement of the Bank of England is as follows

## ISSUE DEPARTMENT

National Debt	
1. Treasury	£382,184,173
1. Banking department	87,271,341
	<hr/>
	£469,455,514

## BANK OF ENGLAND

Capital	£14,883,000
Reserve	3,669,119
Public deposits	21,517,023
Other deposits	
Treasury	89,437,388
Other countries	83,809,874
Seven-day and other bills	1,061
	<hr/>
	£189,915,352

Including Exchange Savings Banks, Commissioners of National Debt and Dividend Accounts.

## INCREASE IN CIRCULATION

The weekly return of the Bank of England made up to Aug. 9 1933 shows an increase of nearly £5,000,000 in the active note circulation which is doubtless connected with internal holiday requirements The stock of coin and bullion has increased by £140,000 and the reserve shows a reduction of £483,000 its proportion to liabilities being 1½ per cent lower at 4½ per cent An increase of £7,381,000 has taken place in the public deposits and as a consequence of this movement together with the contraction in the reserve Other deposits display the heavy fall of £1,900,000 bankers' deposits are down £9,033,000 and Other accounts are lower by £3,849,000

Government securities show a fall of £575,000 but little change has taken place in the Other securities

**Bank Rate**, the rate of interest at which the Bank of England will re-discount Bills of Exchange for the discount market In other countries bank rate is also the rate the central bank charges for re-discounting similar instruments In the United States each of the 12 Federal Reserve Banks has its own rate and changes may be recommended by the Federal Reserve Board

Changes in bank rate have important effects on business and also on the

Government securities	£11,015,100
Other Government securities	263,844,725
Other securities	1,600,012
Silver coin	3,640,163
	<hr/>
Fiduciary issues	260,000,000
Gold coin and bullion	190,155,514
	<hr/>
	£450,155,514

## BANK OF ENGLAND

Government securities	£90,020,963
Other securities	
Discount and advances	11,171,929
Securities	12,385,845
National Debt	87,271,341
Gold and silver coin	1,365,874
	<hr/>
	£182,915,252

foreign exchange position of the currency An increase in bank rate tends to make traders more anxious to sell their stocks of goods because the borrowing of money to carry large stocks becomes more expensive This tends to depress prices with important effects on business and on the balance of trade (*see* GOLD STANDARD) A very high bank rate makes borrowing for commercial and industrial firms very expensive and tends to hinder expansion of business (*see* CHEAP MONEY) *See also* BANKING AND CREDIT MONEY MARKET BILLS OF EXCHANGE GOLD STANDARD CENTRAL BANKS

**Bankruptcy** the status of a person adjudged by the court to be unable to

pay his debts, "insolvency" applying to one is unable to pay his debts but who has not been "adjudged" In 1869 the law relating to it was consolidated, and bankruptcy is now governed by the Acts of 1883, 1890 and 1914, the purpose of the legislation being to secure that the property of a debtor who cannot pay in full shall be divided equitably among his creditors and that the creditor shall then be discharged from his debts either absolutely or on conditions Bankruptcy proceedings may be instituted by the debtor himself (voluntary) or by the creditors, if their claims total not less than £50 The debtor's property is then taken over by the official receiver and a meeting of creditors held at which the debtor must give full information as to his position The creditors then decide whether the debtor is to be adjudged bankrupt or whether a composition can be arranged If the former, a trustee is appointed to distribute the property After the distribution the bankrupt may apply for his discharge, which will be withheld if he has lived and speculated extravagantly, or has failed to keep proper books within 3 years before the bankruptcy, etc A bankrupt is disqualified from holding office as Member of Parliament, Justice of the Peace, mayor, alderman or councillor, the disability ceasing when the bankruptcy is annulled or the bankrupt obtains discharge with a certificate stating that his bankruptcy was due to misfortune The Acts define certain offences, e.g. if the bankrupt obtains credit for £10 or over from any person without informing him of his bankruptcy, and such offences are severely punished

**Banks, Sir Joseph (1713-1820)**, English naturalist and explorer, whose notes on the *Endeavour's* voyage round the world (1768-71), on which he accompanied Captain Cook (*qv*) are very valuable The British Museum received his collection on his death He wrote numerous scientific articles

**Banks of Issue**, banks with the right to issue bank notes Usually central

banks, as the Bank of England Some Scottish Banks also have the right In most countries the central bank has exclusive note-issue rights See also CENTRAL BANKS, BANK OF ENGLAND; BANKING AND CREDIT

**Bannatyne, George (1545-1609)**, collector of Scottish poetry, whose name was given to the Bannatyne Club (1823-61), founded by Sir Walter Scott, for the collection and printing of rare Scottish histories and literature One hundred and sixteen such works were published by the club, and are now much esteemed by bibliographers and collectors

**Bannockburn**, village, near Stirling, Scotland, where the English under Edward II were defeated by Robert Bruce, 1314 The site of the battlefield was acquired in 1929 as a National Park

**Banns**, see BAN, MARRIAGE

**Bantams**, a diminutive kind of fowl supposed to have come from Bantam in Java, the name is now applied to small varieties of most breeds They are pugnacious but dainty birds, laying small eggs

**Banting, Fredk. Grant (b 1891)**, Canadian scientist, Professor of Medical Research at Toronto (1923), best known for his discovery of insulin, a secretion of the pancreas, injected as a cure for diabetes The Banting Institute at Toronto was opened in 1930.

**Bantock, Granville (b 1863)**, English musical composer His best-known work, *Omar Khayyám*, which was produced in three parts at successive festivals (Birmingham 1906, Cardiff 1907, and Birmingham 1909), made a distinct impression In this ambitious work, as also in his *Song of Songs*, Bantock's notable qualities of colourful orchestration and skilful choral writing are found at their best He has written many fine songs and choral pieces besides many bigger works, such as the *Hebridean Symphony* (1910); the orchestral poem *Dante and Beatrice* (1911), and sonatas for viola and violin

**Bantu**, see AFRICA, PEOPLES OF

**Bantu Languages** Under this general heading are grouped the native languages spoken over the greater part of S equatorial Africa. They include Zulu Swahili and Matabele and are clearly distinguished from the Hottentot and the N Negro languages. They are characterised by a profuse use of prefixes and suffixes whereby an original root is capable of a great number of derivative meanings. See *Comparative Study of the Bantu and Semi-Bantu Languages* by Sir H H Johnston (1910).

**Banville** Théodore de (1803-1891) French poet and dramatist began the revival of mediæval French verse form by his own skilful use of them. His works include *Odelettes* *Ballades joyeuses* a play *Guinguette* and a valuable treatise on French poetry.

**Baobab** (or *Monkey Bread Tree*) of Senegal one of the largest known trees. Its trunk sometimes attains a diameter of 30 feet. The pulp of its fruit forms amphisarca and is used as an article of food. The dried leaves

constitute also a popular ingredient of food among the Africans.

**Bapaume** see **WORLD WAR**

**Baptism**, the sacrament of initiation into the Christian Church instituted by Jesus Christ Himself and signifying the cleansing of the recipient from all taint of original sin. The outward form of the rite differs somewhat amongst the various Christian bodies and while most baptisms are infant baptisms some sects only practise adult baptism (see **BAPTISTS**). In all cases water is used as a sign of cleansing. Total immersion is practised amongst certain Protestant sects but in the Anglican Roman Catholic and Orthodox Eastern Churches the sprinkling of water on the forehead accompanied by the sign of the Cross and the words "I baptise thee in the name of the Father and of the Son and of the Holy Ghost" is the usual form. This sacrament though usually administered by a priest can be performed in case of necessity by anyone even a layman or woman.

**Baptistery** (**BAPTISTRI**) In the Early Christian Church baptism was performed by total immersion in a separate building attached to the church for this purpose usually circular or polygonal in shape. When baptism by sprinkling became general such a building was rendered unnecessary and the font was simply placed in a convenient part of the church usually at the west end.

Notable baptisteries are those at Florence with fine bronze doors and at Pisa and the Lateran basilica at Rome.

**Baptists** a body of Protestant Christians who objecting to the practice of infant baptism (qv) formed themselves into a separate denomination in the 17th cent. Their principles are foreshadowed by those of various mediæval sects such as the Albigenses and Waldenses. In the 17th cent. Arnold of Brescia organised a Baptist church in the S of France which was condemned by the Lateran Council in 1139. The Mennonites (qv) and the



Baobab Tree

followers of Robert Browne (*qv*) were 16th-cent Baptists. Since the Commonwealth the communion has expanded considerably in England, and in 1813 the Baptist Union was formed, covering the British Isles. Church government is congregational, though the Union is acquiring more and more power. In America the Baptists have always been powerful, and consist of a number of subdivisions, the most important being the General Baptists, who believe that Christ died to save all men, and Particular Baptists, who believe that He died to save the elect only. There are also Free Will Baptists, Open Baptists, Old School Baptists, differing on several points, but all agreeing on the two main ones—the necessity for adult Baptism, and the Protestant doctrine of the final authority of the Bible.

**Bar**, a partition running across the courts of law for the purpose of separating the court and its officials, including solicitors, King's Counsel, and barristers with patents of precedence, from the prisoners or suitors, their counsel, and the public. To be *called to the Bar* is to be made a barrister. In Parliament the bar marks the technical boundary of each House. Members elected at by-elections must wait outside the bar until their introduction, and there, too, appear non-members charged with a breach of the privileges of the Commons. In the Lords there is also a bar where the Speaker and the members of the Commons stand when summoned by Black Rod.

**Barbados**, British island of the W Indies, E of the Windward Islands. The capital is Bridgetown (pop 13,500). The surface slopes downward from the centre, where Mount Hillaby is the highest point. The soil is fertile, and well suited to sugar and cotton, large quantities of which are produced and exported. Manufactures of rum and molasses are carried on. Imports include foodstuffs and manufactured goods. Government is by a Governor, Executive and Legislative Councils, and an elected House of

Representatives. Area, 170 sq. m., pop (1931) 173,500.

**Barbarossa** (*Redbeard*), Italian name of Frederick I (1123–1190), Emperor of the Holy Roman Empire (1152–90). He acceded to the dukedom of Swabia in 1147 and to the kingdom of Germany in 1152. After establishing order and authority in Germany and Lombardy, he was crowned emperor in 1155. From 1159 to 1177 he was engaged in quarrels with Pope Alexander III. By 1189 he had established peace throughout the empire and, resigning his crown, headed the Third Crusade, in the course of which he was accidentally drowned (*see* CRUSADES). He was a great and good king, and his memory is deeply revered in Germany.

**Barbarossa**, Italian name given to a family of Turkish corsairs of the 16th century. They were active in Algiers and Tunis.

**Barbary**, ancient name for much of N Africa, after the Berbers, who formed the majority of the population. There were numerous piratical strongholds, and Barbary pirates and corsairs were greatly feared. The territory roughly included the modern Morocco, Tripoli, Algeria, and Tunisia.

**Barbary Ape**, *see* MONKEYS.

**Barbary Sheep**, a wild species closely related to the goats, not to the sheep. It is found in mountainous parts of N Africa, from Morocco to Khartum. Its general colour is sandy brown, matching the country, and the male, 3 ft high, carries massive horns about 2 ft long curving back over the neck, has a crest of long hairs on the back, and a long mane on the throat and fore-legs, but no beard. The female is smaller, with less-developed horns and mane. *See also* GOATS, SHEEP.

**Barbauld**, Anna Letitia (1743–1825), English poetess, chiefly remembered for her lyric, *Life*, with its conclusion

"Say not 'Good night,' but in some brighter clime  
Bid me 'Good morning!'"

**Barbed Wire**, wire consisting of several (usually two) intertwined



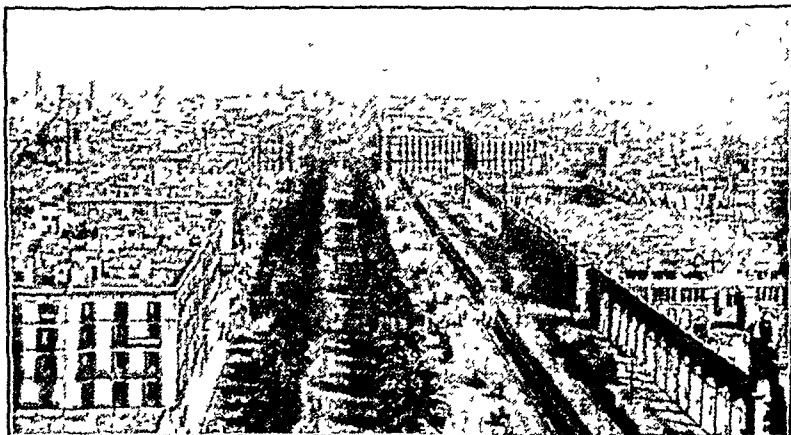
and potash Manufactures include textiles and engineering The chief towns are Barcelona, Gracia, Olban, and Vich Area, 2080 sq m , pop (1931) 1,809,000

(2) Capital of Barcelona province, and chief town of Catalonia, which was granted a limited autonomy in 1932 under the Spanish Constitution following the revolution It is a great port and manufacturing centre, producing textiles, machinery, and fertilisers It is the chief export centre of N E Spain, and ships silk, wine, agricultural products, and cork

with Penn and Fox, and was at one time Governor of E New Jersey (1682) His great work, the *Apology for the True Christian Divinity* (1678), remains a classic of Quaker belief

**Bard**, a Celtic poet, analogous to the Romance minstrel and the Teutonic skald, who in ancient times sang the victories and prowess of his people The term is still used in Wales See EISTEDDRODD

**Bardsey Island**, small island off the W coast of Caernarvon, associated with many legends There are remains of a very early monastery Pop c 60



Barcelona Paseo de Colón

Public buildings of note are the Cathedral, containing the tomb of St Eulalia, the *Casa Consistorial*, the University, and the *Palacio Real* The town was taken by the English in 1705 and by the French in the Napoleonic Wars Pop (1931) 991,000

**Barclay, Alexander** (1476 ?-1552), poet, is known for his *Shyp of Folyes* (1509), a satirical castigation of contemporary vices, adapted from the *Narrenschiff* of Sebastian Brandt (q v), and for his *Eclogues*, which are among the earliest English pastoral writings

**Barclay, Robert** (1648-1690), Quaker theologian and writer, went to America

**Barebones, Praise-God** (c 1596-1679), leather-seller and "fifth-monarchy" man, gave his name to the Barebones or "Little" Parliament (1653), a body of 140, selected by Cromwell, which was dissolved after 5 months

**Bareilly** (or *Bareli*), a city and small district of the United Provinces, British India The district, which is c 1600 sq m in extent, is fertile and prosperous, grain and cotton being the chief crops The natives are mainly Rohillas The city has several fine buildings, including the Navab of Rampur's palace, two ancient mosques, and a Government college Manufacture of furniture, and trade in local

produce are carried on Bareilly is an important military centre Pop (1931) city 144 000

**Barents Island**, one of the Spitsbergen group in the Barents Sea (q v) Much of the year it is snow and ice covered the population is small and poor

**Barents Sea**, part of the Arctic Ocean between Lapland Spitsbergen and Novaya Zemlya It is important for the richness of its fisheries though the industry is carried on under difficulties owing to ice and fog Named after the Dutch navigator Barendsz (d 1597)

**Bargain and Sale** in law a contract transferring property from one person to another used particularly as a means of conveying land in former times so as to avoid the cumbersome feudal requirements The Statute of Enrolments 1535 required such contracts to be registered within 6 months but applied only to conveyances of free holds and to avoid the statute the *lease and release* was developed a bargain and sale would first be made for an estate less than a freehold and subsequently the freehold would be added by a separate deed of release thus being sufficient to take the transaction out of the statute

**Barge** a capacious flat bottomed boat for the conveyance of heavy goods on inland waterways introduced on a large scale in the latter part of the 18th cent Barges vary in size from 30 to 60 tons capacity on English canals to 600-1000 tons in Germany and even as much as 3000 tons on the Great Lakes They are used chiefly for the conveyance of building materials timber coal and similar commodities See also CANALS

**Barham, Richd. Harris** (1788-1845) a minor canon of St Paul's Cathedral London (1821) priest to the Chapels Royal (18 4) wrote the greatly popular *Ingoldsby Legends* humorously satirical poems conceived with great ingenuity of metre and rhyme under the pseudonym Thomas Ingoldsby

**Bar-Hebraeus** (or *Ab Ifaragius*) (12.8-1 86) Oriental writer primate

of the Jacobite Christians (1266) is known for his history of the world up to his own times *The History of the Dynasties* is of great value for its information concerning the Moghuls and Genghiz Khan

**Bari** Italian town on the E coast of Puglia The old town was once a considerable Roman port Modern Bari is a busy commercial town and port Industries include flour milling olive-oil chemicals iron founding There are considerable fisheries which have been worked for centuries Pop (1931) commune 17 000

**Baring** a family of English bankers and statesmen was founded by John Baring who emigrated from Germany His son Francis (1740-1810) who founded the banking firm of Baring Bros was chairman of the East India Company His son Alexander (1794-1848) was created Baron Ashburton in 1835 A grandson Edward Charles raised to the peerage as Baron Revelstoke was in charge of the business at the time of the Baring crisis due to the default of the Argentine Government in 1890 The earldoms of Northbrook and Cromer in addition to the baronies of Ashburton and Revelstoke have been conferred on various members of the family who have held the positions of First Lord of the Admiralty President of the Board of Trade and Viceroy of India

**Baring Maurice** (b 1874) British author and journalist was in the diplomatic service (1898-1903) and a war and special correspondent in 1904 and 1912 Among his works are novels (e.g. *Cat's Cradle* 1905 and *Coal with out Seam* 1909) poems and books on Russian history and literature

**Baring Gould, Sabine** (1834-19.4) English author and hymn writer wrote books on subjects of general historic interest myths folklore etc. theological works and novels which include *Noddy* (1890) and *Red Spider* (1887) His most considerable work was *The Lives of the Saints* (15 vols) The famous hymns *Onward Christian Soldiers* *Through the night of doubt and*



sorrow," and "Now the day is over" are by him

**Barium.** For the characteristics of barium, see the article ELEMENTS. Barium is a metallic element belonging to the group of alkaline earths. The first mention of barium compounds was made in the beginning of the 17th cent., when the phosphorescence of barium sulphide was discovered. Barium occurs in nature in the form of barytes (barium sulphate), and the sulphide is obtained by the reduction of the sulphate by means of carbon. Metallic barium is somewhat difficult to isolate, and the usual method is to electrolyse a solution of barium chloride, using a mercury cathode, barium amalgam is thus formed, from which the barium can be isolated by distilling off the mercury.

**Barium Compounds.** The most widely used barium compound is *barium sulphate*, which is used as a pigment under the name of *blanc fixe*, and, together with zinc sulphide, in the manufacture of *lithopone*. Barium hydroxide (*baryta*) is used in aqueous solution as a weak alkali in chemical analysis and in fat refining. Barium nitrate is used in the manufacture of fireworks to produce green fire.

**Barium Sulphate, see BARIUM and BARYTES**

**Bark.** The covering or rind of a tree or plant-stem, branches and roots, composed of bast-fibres and cork, some having medicinal or tonic qualities, properties of tanning and dyeing. Examples: *Cascara sagrada* (*Rhamnus purshiana*), *Cinchona* (*Cinchona*), and *cassia* (*Cinnamomum cassia*) barks—in medicine; oak (*Quercus alba*) and hemlock (*Tsuga canadensis*) barks—in tanning; *cleutheria bark* (*Craton cleutheria*)—incense; *mezezeum bark* (*Daphne mezezeum*), *crown bark* (*Cudrona officinalis*)—in pharmacy; *potter bark* (*Licania*)—in the manufacture of pottery.

**Barker, Harley Granville** (b 1877), actor, producer, and playwright. He acted, produced, and wrote for the Stage Society from 1900. His manage-

ment of the Court Theatre, where Shaw's plays began their career, brought him fame. As a producer he is known for his experiments and innovations in décor which have led to great changes in that art. His best plays are *The Voysey Inheritance* (1905), *Waste* (1906), and *The Madras House* (1909). He has also published volumes of criticism and translations of Spanish plays.

**Barker, Sir Herbert Atkinson** (b 1869), English manipulative surgeon, has developed a highly successful osteopathic technique, though his work is not formally approved by the medical profession. His knighthood in 1922 was for services in the World War.

**Barlaam and Josaphat**, the title given to a legend which has reached us through the writings of St John of Damascus (qv). It tells of the life of an Indian prince, Josaphat, which up to a point closely resembles that of Buddha, but the prince met and was baptised by a Christian monk, Barlaam, with whom he eventually lived and died.

**Bar-le-Duc**, French town, capital of Meuse department. Manufactures include iron-founding, cotton goods, brewing, and leather. There is a considerable wine trade. The town is ancient, and was once the capital of the duchy of Bar. Pop 17,000.

**Barley** (*Hordeum vulgare*) is the most widely cultivated of cereals, though in this country chiefly for malting and distilling, also for pearl barley. The barley ear is peculiarly formed, with 2, 4, or 6 rows of grain according to variety, the awn having long bristly hairs.

**Barlow, Sir Thomas** (b 1845), physician-extraordinary to Queen Victoria, King Edward VII, and King George V, was created a baronet in 1900 and K.C.V.O. in 1901. He presided over the International Medical Congress, at London, in 1913.

**Barlow's Principle, see GUNS.**

**Barmecides**, powerful Persian family, of whom Yáhya and his sons, Fadl and Ja'afar, attained great importance.

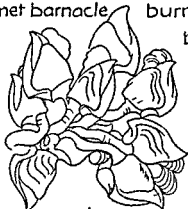
# BARNACLES



coronet barnacle



burrowing  
barnacles



goose mussel or  
duck barnacle



bell  
barnacle

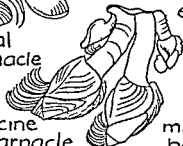


coral  
barnacle



eared  
barnacle

fascine  
barnacle



mitella  
barnacle



under Harun al-Rashid, the famous Caliph of Bagdad. A "Barmecide Feast," as described in the Barber's Tale of the *Arabian Nights*, when one of the family set empty dishes before a ravenous man, has become proverbial.

**Barmen**, German industrial town, a few m E of Dusseldorf, practically adjoining Elberfeld. The chief industry is ribbon-weaving, but other textiles are also worked. Pop (1925) 187,000. See WUPPERTAL.

**Barnabas**, St., originally named Joseph, a Levite of Cyprus, an early Christian missionary and fellow-worker with St Paul, whom he introduced after his conversion to the other apostles. He is mentioned several times in the Acts of the Apostles, and himself ranks as an apostle in Christian liturgy. Feast, June 11. An early Christian document of mystical tendencies, the *Epistle of Barnabas*, written between A.D. 70 and 130, was formerly mistakenly ascribed to him.

**Barnacle**, a crustacean with a valvular shell supported on a long tough flexible stalk, by which it is attached to rocks, floating timber, or the bottoms of wooden ships. See ill p 471, also ACORN SHELL.

**Barnacle Goose**, a goose of the N hemisphere, brownish grey, with a nearly white head. It is interesting on account of the legend that it was produced by the stalked barnacle (qv). It is sometimes called the Bernicle.

**Barnardo, Thomas John** (1845-1905), philanthropist, founder of Dr Barnardo's Homes (1866), in which destitute children are trained and subsequently found employment. There are 178 branches, including Village Homes, Garden Cities, babies', cripples' and invalid homes, devoted to the rescue and education of the friendless young.

**Barnato, Barnett** ("Barney") Isaacs (1852-1897), financier, of humble birth, went to S Africa in 1873, and became a millionaire by diamond-dealing. The Barnato Mining Com-

pany of Kimberley (1881) was amalgamated with Cecil Rhodes's De Beers Company in 1888. Barnato was a member of the Assembly (1888 and 1894), after severe losses in the Kaffir "boom" of 1895 he committed suicide by drowning in 1897.

**Barnby, Sir Joseph** (1838-1896), English musician and composer of oratorios and sacred music. He held various posts as organist, was appointed to the conductorship of the Albert Hall Choir in succession to Gounod, and became Principal of Guildhall School of Music in 1892. Composed *Sweet and Low*.

**Barnes, Ernest Wm.** (b 1874), Bishop of Birmingham since 1924. Master of the Temple (1915-19). His "modernist" views, and in particular his objection to Reservation, have led to conflict with the Anglo-Catholics in his diocese.

**Barnes, George Nicoll** (b 1859), Labour politician, trade-union leader and for a time chairman of the Parliamentary Labour Party. He represented Glasgow in Parliament 1906-22, was Minister of Pensions 1916-18, and a member of the War Cabinet 1917-20.

**Barnes, William** (1800-1886), philologist and poet, Rector of Winterbourne Came, Dorset. His poems, many of which are of great beauty, are an example of the comparatively rare elevation of a dialect (Dorset) into a literary language.

**Barnet**, town in Herts, 11 m N of London. A well-known horse and cattle fair, dating from the reign of Henry II, is held in Sept. In 1471 a battle fought here resulted in the defeat and death of Warwick "the king-maker." Near by are an Elizabethan grammar school, and the Physic well mentioned in Pepys's *Diary*. Suburbs are East Barnet and Friern Barnet. Pop (1931) 14,725.

**Barnett, Samuel Augustus** (1844-1913), philanthropist, Canon of Bristol (1893), helped to found and was first warden of Toynbee Hall, Whitechapel (1884-1906), the London University settlement. With his wife, *Dame*

**Henrietta Barrett** he wrote *Practicable Socialism* (1893) and other religious and social works His wife was one of the founders of the Hampstead Garden Suburb

**Barnsley** mining and manufacturing town in the W Riding of Yorkshire c 90 m S of Leeds Industries include iron and steel manufactures glass chemicals and coal mining Barnsley dates from before Domesday times but it did not attain importance until the coal began to be worked The grammar school dates from the 17th cent and the famous Monk Bretton Priory is not far from the town Pop (1931) 1599

**Barnstaple**, a municipal borough and port for coasting traffic near the mouth of the R Taw in N Devon Its burgesses are mentioned in the Domesday survey and the port was of considerable importance in the Middle Ages The earliest known charter was granted in the 11th cent The once-famous wool trade has disappeared but a number of minor industries (cabinet making boat building potteries lace and glove manufactures) are carried on There is a 14th-cent grammar school and 17th-cent almshouses Pop (1931) 1400

**Barnum**, Phineas Taylor (1810-1891) American showman who after owning a country store and having some connection with lotteries founded his Greatest Show on Earth by exhibiting Joyce Keth an ancient negress whom he passed off as the nurse of George Washington In 1841 he bought the American Museum where General Tom Thumb was shown In 1850 he was impresario to Jenny Lind The great travelling circus Barnum and Bailey's took the road in 1871 Of his books his *Autobiography* (1934 *et seq*) is one of the most interesting

**Baroda**, NW province in the Gujrat district of Bombay India total area 8160 sq m The chief products are cotton tobacco grain and sugar and there is a Government monopoly of opium Baroda has been

a sphere of British influence since 1779 when the Gaekwar was deposed for misgovernment Education is compulsory and there are more than 500 schools and colleges A Resident represents the Governor General The capital is the city of Baroda situated on the R Narmada Pop (mainly Hindus) State 443 000 city 11900 (1931)

**Barometer** an instrument for measuring the pressure of the atmosphere The mercury barometer is based upon the experiment of Torricelli performed in 1643 Taking a long glass tube closed at one end he filled it with mercury and then inverted it with the open end under the surface of a mercury filled vessel He found that if the length of the tube exceeded 30 in or so the mercury fell away from its end leaving a space completely free from air which is now known as the Torricelli vacuum The difference of level between the mercury inside and that outside the tube is independent of the tube's shape length or size but varies from day to day Torricelli quite rightly deduced that this height was a measure of the weight of pressure of the air The diagram shows that the column of mercury in the tube is supported by the pressure of the atmosphere upon it For further explanation see HYDROSTATICS

The mercury barometer is now hardly used except in the laboratory where it takes two forms one being the siphon barometer (Fig 2) which is sufficiently accurate for the everyday work of the gas analyst and others requiring to know the absolute value of the air pressure to about 0.1 mm It consists of a glass tube bent in the form of a siphon and mounted against a scale drawn upon ordinary mirror glass It is read by direct observation of the two mercury surfaces care being taken that each should be seen on an exact level with its image in the mirror whereby errors arising from the level of the eye in reading are avoided The other variety of mercury barometer used where greater accuracy is

required, follows the original type of Fig 1. It takes two forms. In the Fortin type, the reservoir is made flexible, and by means of a screw its

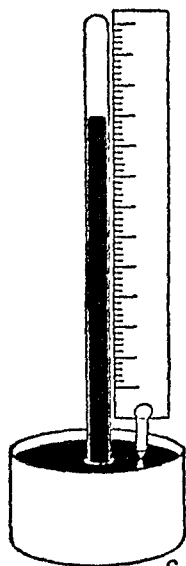


fig 1

Barometers



fig 2

volume can be adjusted until a point is seen to touch the surface of the mercury exactly, whereupon the mercury in the tube is read off against the scale by means of a special device. In the Kew type, the cistern is made truly cylindrical and of an exact diameter. The mercury rises in this as it falls in the tube, and hence the fall in the latter does not represent the whole change in the barometer. In the Kew type, only the mercury in the tube is read, the scale being made shorter by the necessary amount to compensate for the rise in the cistern.

The aneroid barometer is based upon an entirely different principle. A chamber shaped like a very shallow

closed pill-box is made of thin sheet metal corrugated in rings. The box is perfectly air-tight, and almost completely exhausted of air. The effect of this is that the external air pressure tends to make the box collapse, but this force is resisted by attaching the centre of one face of the box to a base plate, and the centre of the other face to strong springs which compensate the pull at normal atmospheric pressure. When the pressure rises, the spring gives a little, and the box is slightly crushed, when it falls, the spring pulls the box slightly more open, these motions being rendered possible by the corrugations. The motions are very small, but are magnified by means of levers and other devices, until a pointer, or, in the case of a recording barometer, a pen, is given a motion sufficient to enable changes in the barometric height to be read with accuracy.

Aneroid barometers are much used in aviation, mountain climbing, and the exploration of the upper atmosphere by pilot balloons to determine height above sea-level, which is readily calculated when the height of the barometer at sea-level is known. Such instruments are called *altimeters*. The air pressure diminishes by about 1 in. of mercury for every thousand feet, but for accurate work it is necessary

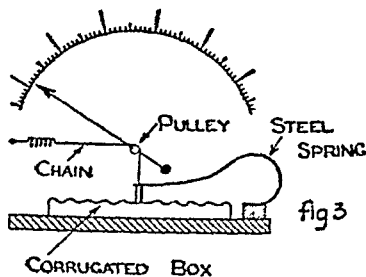


fig 3

Section of Aneroid Barometer.

to take account of the temperature of the air.

Baron, a title introduced at the Norman Conquest, originally applied

to all who held lands from the King. A rough division between greater barons who were summoned to the Great Council by the King and the lesser who were summoned by a Sheriff is found in the Magna Carta (1215). The former came to constitute the peerage and their numbers were added to by letters patent from the 14th cent. on. A special baron's coronet was granted by Charles II. There are now c. 450 British barons. On the Continent the title carries little dignity and in Germany is inherited by all the children of one bearing it.

**Baron, Bernhard** (1850-1909) Jewish cigarette manufacturer and philanthropist born at Br. St. Litovsk, Russia in poor circumstances and brought up among the Don Cossacks at Rostov. At a tender age his father took him to America and there after working in a tobacco factory he began making the newly popularised cigarettes by hand. He invented a cigarette making machine which he brought to England and sold for £160,000, buying the tobacco business of Mme. Carrera in 1903 with the proceeds.

In the later years of his life he engaged in charity on a vast scale contributing over three quarters of a million pounds to hospitals as well as endowing a trust for the benefit of hospital and asylum patients. Despite these activities his fortune on his death at Brighton amounted to £5 millions.

**Baronet** a title instituted by James I. in 1611 each baronet created by him supplying funds to maintain 30 soldiers for 3 years for the defence of Ulster. It was limited to those with an income of £1000 a year from land and who had borne arms for at least 3 generations. The total number was not to exceed 200. Fourteen years later another order of baronets was founded by Charles I. to raise funds for the colonisation of Nova Scotia the price being 3000 marks. In 1893 the Honourable Society of the Baronetage was formed for the purpose of securing and maintaining certain

privileges for the order and this body has continued as the Standing Council of the Baronetage which protects the order against infringement of its privileges with especial reference to the baronetage of Nova Scotia in which the title can descend collaterally as well as by the direct line.

**Barons War** the war waged by the Barons under the leadership of Simon de Montfort against Henry III of England. There was considerable opposition to Henry III on the part of the Barons because of his foreign associations and because of the taxation rendered necessary by his policy in regard to Sicily, the throne of which had been offered to his second son. The barons gained the case by the Provisions of Oxford (1258) but Henry revoked these 1261. In 1263 the Barons led by de Montfort rebelled. At the battle of Lewes the King and his eldest son were captured. Dissensions amongst the leaders of the baronial party many of whom objected to the administration of de Montfort and his colleagues the Earl of Gloucester and the Bishop of Chester gave Edward Henry's son his opportunity. The Barons were defeated at Evesham 1265 and the rebellion was easily put down after de Montfort's death in that battle.

**Baroque** term used to express the development from the Renaissance style in architecture painting and sculpture which arose in Italy in the mid 17th cent. The word was originally descriptive of ill-shaped pearls. The characteristic feature is a floridity of expression—curves in preference to straight lines heavy ornamentation the employment of large amounts of gilding and vari-coloured marbles in the interior of buildings and the use of domes in preference to spires in churches. The style was highly popular and spread all over Europe even to S. America where the Cathedral of Lima, Peru is an excellent example. Until recently Baroque has been regarded as a debased style but it is now generally realised that it is a fine

expression of the age, and correspondingly interesting

See Sacheverell Sitwell, *Southern Baroque Art*

**Barotseland**, area in N.W. Rhodesia inhabited by a tall negro race, since 1911 a part of N Rhodesia. The chief administrative station is Mongu. The district is fertile and well watered, and the natives chiefly engaged in wicker-work. Lualaba is the seat of the paramount chief. Area, 180,000 sq. m.

In 1891 Barotseland came within the British sphere of influence. The British S. Africa Company entered into friendly relations with the principal chief, and a resident administrator was appointed in the interests of the Company. British Government control superseded control by the Company in 1924.

**Barque**, a three-masted vessel, square-rigged on all except the aftermost mast, which is fore-and-aft rigged.

**Barra**, an island off Inverness-shire, Scotland, at the S. point of the Outer Hebrides, the scene of the victory of Robert Bruce, early in the 14th cent. Pop. (1921) 2,311.

**Barracks**, buildings for the residence, drilling, and training of troops or police. There are quarters for officers and men, both married and single. Recreation-rooms, gymnasiums, and canteens are provided by the Regimental Institutes.

**Barracuda**, an important marine food-fish of S. America, S. Africa, and Australasia.

**Barrage**. (1) In engineering, a dam or artificial obstruction built across a river to deepen the upper waters or to create a lake.

(2) In a military sense, a curtain of shell-fire from a line of guns firing simultaneously, and differing from a bombardment in covering only a fixed line instead of an area. It was developed largely to protect infantry advances, and a timed creeping barrage often enabled the latter to attack successfully when the barrage was raised.

**Barranquilla** [BARRANK'LYA], town in the republic of Colombia, connected with the coast at Puerto Colombia, a distance of 17 m. Situated on the Magdalena, it is one of Colombia's chief commercial towns, the bulk of its trade being in coffee and hides. A project is maturing to convert it into an ocean port by deepening the mouth of the river so that ocean liners can ascend. Pop. (1928) 139,974.

**Barratry**, the crime of habitually stirring up quarrels or maintaining law-suits, or of continually disturbing the peace by brawls, in contracts relating to shipping, marine insurance, etc., willful wrongdoing on the part of the master or crew which injures the interests of the owner of the ship or cargo.

**Barrel**, see COOPERAGE.

**Barrel-organ**, an organ in which a bellows is operated by the turning of a handle, a cylinder fitted with pins opening valves which admit air to a series of pipes, not to be confused with the street automatic piano, commonly called a barrel-organ.

**Barrès, Maurice** (1862-1923), French author and politician, was an intense individualist and nationalist, a deputy, and a member of the French Academy. His daily articles in *L'Echo de Paris* and his books, including *L'Ennemi des Lois* (1893), *Le Culte du Moi* (1893), and *Le Génie du Rhin* (1921), had great influence.

**Barrett, Sir Wm Fletcher** (1814-1925), English physicist, discoverer of "Stalloy" (silicon-iron alloy), used in electrical work, did research work on the divining-rod, and helped to found the Society of Psychical Research. Barrett was Professor of Physics at Dublin University.

**Barrett, Wilson** (1816-1904), English playwright and actor, especially of melodrama. He was seen in *East Lynne* (1861), *The Lights of London*, and *The Silver King*. His most famous play was *The Sign of the Cross* (1895).

**Barricade**, a military obstruction thrown up to check the enemy. In

medieval times they were usually formed of palisades and spiked sticks calculated to throw cavalry into confusion. Sand bags, logs, trees, wagons, furniture and any available material may be used. Barricades have also played a part in rioting and street fighting as in the case of the Paris Revolution of 1848.

**Barrie, Sir James Matthew Bart O.M.** (b 1860) dramatist and novelist began as a journalist in Nottingham and London. In 1887 his first book *Better Dead* appeared and his characteristic humour and pathos were manifest in *Auld Licht Idylls* and *A Window in Thrums*. *My Lady Nicotine* and *The Little Minister* (1891)



Sir J. Barrie.

added to his reputation. His genius found its true expression however in the drama and his fanciful and whimsical plays have enjoyed great fame. The best known is *Peter Pan* (1904) and others include *The Admirable Crichton* (1902), *A Slice of Life* (1910), *A Kiss for Cinderella* (1916), *Dea Brutus* (1917), *Mary Rose* (1920), *Barbara's Wedding* (1922). He was made a baronet in 1913 and appointed to the Order of Merit in 1922.

**Barrier Reef**, coral reef off the N.E. coast of Australia, estimated to extend over 1000 m. The area covered by the reef is 100,000 sq. m. and it forms a huge natural breakwater, the extremely wide channel which separates it from the coast of Queensland being not only a secure passage but also of exceptional beauty.

**Barrister** a member of the bar, the highest category of lawyers who alone have the right of audience in the superior courts of law. *See also* INNS OF COURT, LEGAL EDUCATION.

**Barrow** (*a chae!*) *see* BRONZE AGE.

**Barrow Isaac** (1630-1677) English divine and mathematician was Professor of Greek (1660) of Geometry (1662) and of Mathematics (1663) at Cambridge University. In this last post his pupil Isaac Newton succeeded him. His works include mathematical and theological treatises.

**Barrow in Furness** town and port of Lancs. pop. (1931) 68,366 situated on Morecambe Bay facing Walney Island, a part of which is connected with the borough. The discovery of iron in the neighbourhood led to an industrial awakening and from small beginnings a busy commercial centre has been created. There are ship-building yards, iron and steel works with their subsidiary industrial interests, extensive docks and a boat service to Ireland.

**Barry, Sir Charles** (1793-1860) English architect. The Manchester Aquarium, Halifax Town Hall and the Trafalgar and Reform Clubs in London are examples of his work. His master piece is the Houses of Parliament, London, for which he submitted the prize-winning design in 1835.

**ELMAR MILDRED BARRE** (1830-1880) his son also an architect designed the Covent Garden Theatre and Charing Cross and Cannon Street railway bridges.

**SIR JOHN WOLFE WOLFE BARRY** (1836-1918) his youngest son, an engineer, built docks at Cardiff and Grimsby and the Tower and New Bridges.

**Barrymore, John** (b 1897) American stage and film actor. He made his debut in *Magda* 1903 and played later in *Hamlet*, *Richard III*, *Are you a Mason?* and *Peter Ibbelton*. On the screen he has starred in *Sherlock Holmes*, *Bravo Brummel*, *Grand Hotel*, *Mad Census* and *Rasputin*. His sister



Ethel (b 1879) and brother Lionel (b 1878) are equally prominent actors on the American stage



John Barrymore

**Bart, Jean** (1651-1702), French admiral, a skilful and daring commander. During the war between France under Louis XIV and England under William III, he harried the British and Dutch fleets, and made descents on the E coast of Scotland and on Newcastle.

**Barter**, the exchange of goods for goods without the use of money. In primitive communities this method of exchange precedes the development of any type of money. In modern times a certain amount of barter takes place in remote rural districts. See also **Money**.

**Bartholdi, Frédéric Auguste** (1834-1904), Italian sculptor, born in Alsace. His works include the famous 220 ft "Statue of Liberty" on Bedloe's Island, New York (unveiled 1886), "The Lion of Belfort", the monument to Vergingetorix, leader of Gauls, and "Grief".

**Bartholomew, St.**, one of the twelve Apostles, generally identified with

Nathanael, is said to have preached in India and Asia Minor, and to have been martyred in Armenia or Cilicia. He is generally represented in art holding his skin over his arm, in allusion to his supposed manner of death by slaying. His day is Aug 24.

**Bartholomew Fair** was held in London annually on St Bartholomew's Day from 1133 until it was abolished as a nuisance in 1855. It took place at W Smithfield, was the principal cloth fair of England, and also of some importance for the marketing of other goods, including cattle. Until 1691 it lasted for 2 weeks, and afterwards for 4 days. Its side-shows, exhibitions, and showmen made it one of the chief popular entertainments in London, and are excellently represented in Ben Jonson's comedy *Bartholomew Fair* (1614). For its last 15 years, the Fair took place at Islington, and the annual *World's Fair* of the present time is probably the nearest—but a very modified and refined—approach to it in the London of to-day.

**Bartholomew's Hospital, St**, founded by Rahere, jester to Henry I, in 1123, on its present site in W Smithfield, London, in connection with the Augustinian Priory. After the Dissolution of the Monasteries it was refounded by Henry VIII, who, in 1517, granted it to the City Corporation.

There is a medical school attached, at which Sir Thomas Bodley and John Caius were students. Harvey, discoverer of the circulation of the blood, was a physician there from 1609-1613. More than 100,000 patients are treated each year.

**Barthou, Jean Louis** (b 1862), French statesman, Prime Minister (1913), and Senator (1922), an authority on Trade Union history and law.

**Bartók, Béla** (b. 1881), Hungarian composer and musician, whose researches into, and modern treatment of, Hungarian and Rumanian folk songs have won him a wide fame. His chamber music has been frequently heard in Europe and America, and his advocacy and practice of "atonality"

('music without key') has aroused much interest. He has made personal appearances in London.

**Bartolozzi, Francesco** (1727-1815) Italian engraver lived in England from 1764 to 1802. The diploma of the Royal Academy of which he was one of the first members was engraved by him. In 1802 he settled in Portugal where he headed an engraving school. His best works deal with classical subjects.

**Barton Elizabeth** (1506?-1534) also called the holy maid of Kent used to prophesy under the direction of a monk who used her as a tool. She caught the popular imagination as an anti-Protestant and opposition in Kent to the Reformation centred round her. She was executed for high treason.

**Barton Beds** *see* EOCENE SYSTEM

**Bartonia**, *see* FOXGLOVE FAMILY

**Baruch, Bernard** (b 1870) American financier and politician. In 1917 he became head of the commission in charge of Allied purchases of raw material minerals etc. and in 1918 was chairman of the War Industries Board. As a member of the Supreme Economic Council he had a share in the Treaty of Versailles. For his services to the Allies he received many European decorations. He was in close touch with President Wilson throughout his political career and a personal adviser of President Franklin Roosevelt.

**Baryta**, the popular name for barium hydroxide (*see* BARIUM)

**Barytes** [*pron* BÄR I TĒZ] barium sulphate. Occurs in flat tabular crystals or as nodular or granular masses. It is found usually in veins in rocks where it was laid down by percolating water in the fissures. It may also be a residual deposit from the decay of beds containing it. It is often associated with veins of lead ore. The mineral is remarkable for its weight. Commercially it is used as a pigment when mixed with white lead for dressing calico and for imparting the weight to leaded paper. In Lag

land it is found in the Midlands, Cumberland and Westmorland and it is common in the United States.

**Basalts** are the commonest basic lavas. In colour they are very dark grey varying to black brown or dark green and they may be compact or contain vesicles which when filled with a secondary mineral are called amygdulæ. The minerals originally present as constituents of the rock are usually feldspar, augite and olivine and some basalts contain large crystals embedded in the groundmass.

Throughout geological time there have been frequent outflows of basaltic lava on a large scale, the lava issuing from fissures and it is now considered that a potentially liquid substratum of basalt may everywhere underlie the visible crust of the earth.

These basalt flows often form broad plateaux of successive sheets of lava as in the N.W. United States where the rock is 4000 ft thick over an area of more than 200 000 sq. m. The basalts of the Indian Deccan cover about the same area but are even thicker. Another important region of occurrence is the Auvergne.

The basalts of the W. coast of Scotland and N.E. Ireland are probably remnants of a great basalt plateau which stretched away to Iceland. In this area the basalts are often jointed into hexagonal columns as in Fingal's Cave, Staffa and the Giant's Causeway, Antrim. Formerly the term basalt was restricted to lava flows of Tertiary age and this procedure is still followed to some extent especially on the Continent.

**Base (chem.)** A base may be defined as a substance which possesses alkaline properties and consists of a metal combined with one or more hydroxyl (OH) radicals. If a base is combined with an acid it forms a salt and water. A typical base is sodium hydroxide NaOH. In modern terminology a base may be said to be a substance which will accept a proton or hydrogen nucleus. *See also* CHEMISTRY, ELECTROCHEMISTRY.

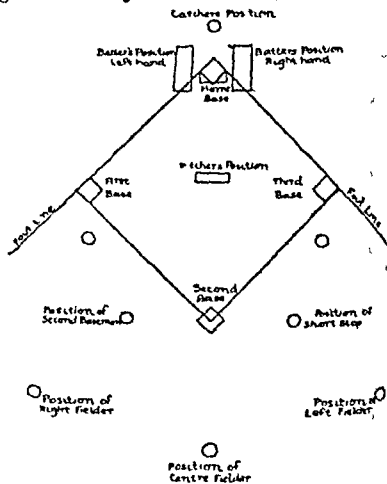
Baseball, national summer game of U.S.A., popular also in Canada and Japan, played with bat and ball between two teams of 9 players a side. Its origin is doubtful, some authorities regarding it as a derivative of rounders (*qv*), while others hold that it was evolved independently in New York in 1839. The earliest club to play organised matches was the Washington Baseball Club, New York, founded 1843. The first National Baseball Association was founded in 1858. The Cincinnati Red Stockings, the first all-professional baseball team, was formed in 1868.



"Babe" Ruth, the idol of American Baseball "Fans"

Baseball may be played on any smooth, level field, about 150 x 100 yds. A square, known as the "diamond," with sides 30 yds long, is marked out in white chalk, and cut and rolled like a cricket pitch. One corner, 30 yds from the edge of the field, is marked with a 5-sided white plate called the "home base", the other 3 corners, known as 1st, 2nd, and 3rd base, are marked with pegs to which stuffed white canvas bags are attached. The lines from the home base to the 1st and 3rd bases are prolonged indefinitely, and known as "foul-lines". Each side has 9 innings, unless the side batting last does not need its 9th innings to win. If after 9 innings a side the game is a tie, an

additional innings is played. A full game usually lasts from 1½ to 2 hours.



Plan of Baseball Field

Three batsmen have to be "put out" in each innings. A run is scored when a batsman has encircled all the bases without being put out, the greatest number of runs scored deciding the result of the game. A runner not reaching the home base, and not being put out, is said to be "left on base".

The ball is of white leather over yarn with a rubber core, about 9 in in circumference, and 5 oz in weight.



Hard Hitting

The bat is round, not more than 42 in long, or 2½ in in diameter.

The fielding side consists of *pitcher*, *catcher* 1st 2nd and 3rd *basemen* and *short stop* (in fielders) and *left centre* and *right fielders* (out fielders)

The *pitcher* throws the ball to the *batsman* either under or over arm. The *catcher* stands usually 1 yd behind the home base. The chief duty of the *in fielders* is to put the *batsman* out by touching him with the ball held in the hand while he is running between bases. The *out fielders* catch or stop long hits and return them to the *base men* who endeavour to put the *batsman* out before he can make base.

The *batsman* stands three-quarter facing the *pitcher* in a marked parallel *telegraph* 6 x 4 ft known as the *box*. His object is to reach the 1st base without being put out. Hits must be between the foul lines (see diagram) otherwise it is a foul hit and may not be run for. A ball struck with a dead bat is called a *bunt* a hit which enables the *batsman* to pass all three bases and reach the home base without being put out is a *home run*. The *batsman* may be put out if a hit whether fair or foul is caught before it touches the ground. If touched by a *baseman* with the ball in hand before reaching base if in striking he oversteps the *box* or if he unsuccessfully attempts 3rd strike and is struck by the ball or the ball is caught by the *catcher*.

A runner on 1st base may advance to 2nd if the *batsman* is entitled to 1st base. Two or even three *batsmen* may be put out off one stroke (double and triple plays). A *base runner* is out if hit by a ball struck by the *batsman*.

The game is controlled by one umpire or two in important matches. **Baseball**, see **BASLE**.

**Bashkir Republic** autonomous republic of the U.S.S.R. immediately S of the Ural Area and consisting partly of the S and W slopes of the Ural mountains. The climate is very cold and rainfall uncertain. Cereals are grown though less than before the World War and herds of cattle horses

and sheep are raised. Dairy farming is carried on. The region is rich in minerals including copper iron coal and some gold. Industries most of which are small include flour milling timber leather and distilling. The chief towns are Ufa and Sterlitamak. Area 157 000 sq km pop. (Bashkirs Russians Latvians Jews etc) 900 000.

**Bashkirtseff Marie** (1860-1884) Russian diarist was a woman of remarkable talents in music art and literature. Her printings are good but she is mainly known for the diary which she kept for eleven years and which reveals her inmost feelings and desires. She travelled widely and was known for her culture but she succumbed to consumption when only 24.

**Basic Refractories** see **FURNACE**. **Basile**, name of two Byzantine Emperors.

**BASIL I** (86-886) the Macedonian attained the throne by murder and assassination and founded the so-called Macedonian dynasty. His reign was marked by considerable territorial expansion administrative efficiency the publication of the *Basilica* (revived laws of Justinian) and the independence of the Greek Church (877).

**BASIL II** (96-1025) *Bulgarski Ktonos* the Bulgar slayer was a cruel though a very successful ruler. He annexed Armenia and utterly defeated the Bulgarians at Bellasitsa in 1014 blinding 15 000 prisoners. Under Basil the E. Empire almost recovered the position that it had won in the time of Justinian.

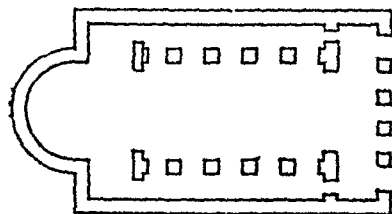
**Basil** (*Ocimum basilicum*) a seasoning herb easily raised from seed. *Basil* is the best kind a neat little shrub 1 ft high bearing spikes of white flowers. The leaves are very aromatic and are used in both perfumes and seasonings.

**Basil, St.** (3-5-370) the Great Bishop of Caesarea (370) and founder of the monastic order (Basilians) named after him including practically all the monks and nuns of

Orthodox Church (*qv*) Basil produced numerous sermons and other devotional and theological treatises, and is honoured as a "Doctor of the Church" Feast day, June 14

**Basil, St**, Liturgy of, *see* LITURGY.

**Basilica**, Roman name for any building for public use which had a roof The usual form was a large hall with a platform, and either a corridor



Basilica Plan

or side aisles running round With the rise of Christianity this style was adopted for churches, and is the basis from which all W church architecture has developed

**Basilisk**, a tropical American tree-lizard Originally the term was applied to a fabulous monster of Libya, supposed to be king of the serpents, and suggested as the original of the cockatrice of the Bible

**Baskerville, John** (1706-1775), English printer, designed new type faces, and produced books much sought by collectors

**Basket-ball**, a game which may be played either out of doors or in a gymnasium, was invented in 1891 by J Naismith, of Springfield, Mass, USA

At each end of the field of play, usually about 60 x 40 ft, a basket, consisting of a net attached to a metal ring 18 in in diameter, is suspended 10 ft above the ground, 6 in behind the net is a backboard, 6 ft long by 4 ft high An inflated leather-covered ball 30 in in circumference has to be propelled into the opponents' goal, i.e. the basket, by throwing it Any number of players may take part, but the game as generally played between teams of 5

a side. The two opposing "centres" standing in a 4-ft circle in the centre of the ground, the referee starts the game by tossing the ball over the heads of the players, who try to throw it towards the opponents' goal The ball is then "in play," until it passes over one of the boundary lines, or until a goal is scored or a foul committed When thrown "out" the ball is tossed back by a player from the point at which it passed over the line

There is no "off-side" rule For a "foul" a "free throw" may be awarded to the opposing side, to be taken 15 ft. from opponents' goal A goal scored while the ball is in play scores 2 points, a goal from a free throw 1 point A player may interfere with an opponent in possession of the ball, but may only use one arm, and may not hold The ball must be thrown as soon as caught, running with the ball is not allowed.

**Basket-making**, the weaving of cane into various designs to form receptacles It is one of the oldest crafts, older even than pottery For an amateur the easiest material to use is pulp cane for small articles Much stronger materials are needed for chairs The cane should be damped before use to make it pliable The necessary tools are a short sharp knife, a napping iron to keep the weaving level and regular, a bodkin to help to prise up the cane if stiff, and a pair of round-nosed pliers Fig 1 shows how to start, with the main stakes slightly thicker than the ones for weaving Fig 2 shows how the stakes are gradually spread out Different patterns may be brought in to give the weaving its correct tone

Slewing is one variation, two canes being woven at the same time In pairing the weaving is done in front of one stake, then behind two The sides of a basket are usually begun by several rows of "upsetting," a special twist which strengthens the base of the sides Walling is almost the same as upsetting, but is usually applied to

the band found just beneath the finishing border (see Fig 3)

Basket Willow see WILLOW

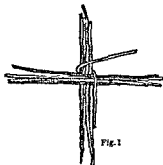


Fig. 1

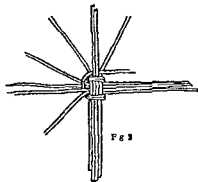


Fig. 2



Fig. 3

Basket willow

Basle (*Bâle*) capital of the canton of Basle Switzerland Pop (1930) 157 030 The town is divided by the Rhine crossed by four fine bridges There is much industrial activity but

manufactures are meagre being chiefly ribbons woollens and a little leather The University founded in 1459 is composed of several faculties Near the Münster stands the Ethnological Museum and Art Gallery the latter containing a few pictures by the Holbeins Dürer and Arnold Böcklin who was born there It is the seat of the Swiss Industries Fair and of the Bank for International Settlements During the Middle Ages Basle was ruled by a bishop a prince of the German Empire An earthquake in 1356 almost destroyed the town In 1390 it became a free imperial city but on the expulsion of the bishops was admitted into the Confederation in 1501 A number of peace treaties have been concluded in Basle notably between France and Prussia and France and Spain both in 1795

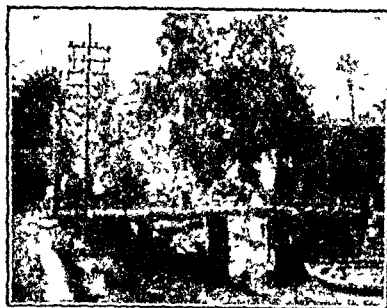
It is an important railway junction standing at the meeting place of three countries Germany France and Switzerland

Basle canton is one of the most populous occupies 163 sq m and is populated by (1930) 92 541 Agriculture is the chief pursuit

Basle Council of a general council of the Church convened by Pope Martin V (1431) the final attempt at control on the part of those holding the Conciliar theory i.e. that the real authority of the Church resided in a general council rather than in the Papacy Matters came to a climax over the attempted conciliation of the Hussites disapproved of by the Pope Eugenius IV who ordered the Council to dissolve Disregarding Papal interference the Council concluded peace with the Hussites in 1433 by the Treaty of Prague ratified by a Bull in the same year The attempted fusion of the Greek and Latin Churches and certain measures of internal reform were met with strong opposition resulting in the deposition of the Pope Amadeus of Savoy being elected (1439) in his place At the death of Eugenius IV (1447) instructions were issued to the Church to obey the new Pope

Nicholas V, 1117, and the strenuous attempt to effect Church reform from within ended

**Basque Language**, the native speech of certain parts of the Pyrenees



Basra An Old Bridge

It is remarkable for its wealth of proper names, and great scarcity of words to express abstract and general ideas

**Basque Provinces**, so named after a race of the W Pyrenees occupying the provinces of Alava, Guipuzcoa, and Vizcaya (Biscay) in Spain, and parts of Basses Pyrenees, a Department in France The estimated pop of Basques in Spain and France is 550,000, of which only 150,000 are resident in France There are two important towns in the Spanish provinces, San Sebastian in Guipuzcoa and Bilbao in Vizcaya

The origin of the race is uncertain They have been termed Iberians, connected with a fair-skinned African people, or with the remnants of a tribe who escaped from a now lost American land, but they mainly resemble Mediterraneans in type

Their language has no certain affinities with any other tongue, and Elliot Smith has suggested that it may be a survival of that of the Cro-Magnon (*qv*) peoples A deeply religious people, they have given to the world two famous names, Loyola and Francis Xavier

A characteristic of the race is their strenuous defence of independence

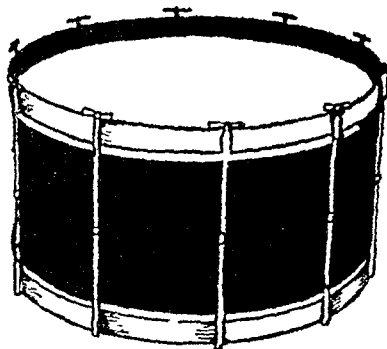
They have been conquered by Romans and Visigoths, but never assimilated. Their pursuits or avocations are mainly fishing and agriculture Many Basques may be found in the Newfoundland fisheries, and it is estimated that in N and S America and Canada there are nearly 100,000 of them, many retaining their quaint costumes, their language, and religion

**Basra** (*Basrah*, or *Busra*), vilayet and river port of Iraq, on the Shatt-al Arab, the second most important outlet to the Persian gulf. Dates are the principal export, but there is a growing grain trade Basra was founded c the 6th cent AD, it fell to the Turks in the 17th cent and declined in importance After the World War it regained its old position Pop, vilayet 785,500, town (1920), 165,500

**Bas-Rhin**, see ALSACE-LOPRAINE

**Bass**, see FRENCH

**Bass Drum**, see ORCHESTRA



Bass Drum

**Bassein**, district, town, and river of Lower Burma The district, c 4000 sq m in extent, produces much rice. The town handles large imports and exports It lies on the Bassein R., and has great possibilities as a river port Rice-milling is the chief industry Pop, district, 490,000, town (1921) 42,500

**Basses Alpes** [**BASS-ALP**], mountainous French Department on the Italian border, the highest point being Aig-

ville de Chambeyron (11 000 ft)  
Fruit and vines are grown in the valleys sheep and cattle pastured on the hills but on the whole the district is poor though tourist traffic is a source of revenue The capital is Digne (c 4500) Area 2 00 sq m pop (19 6) 88 400

**Basses-Pyrénées** (BASS PÉRINÉ) Département in the extreme SW of France bounded by the Pyrenees in the S and by Landes in the N The S. is mountainous the highest peak being Mourron (9 000 ft) Soil is generally fertile and crops of fruit grain, and vegetable are grown and large flocks of sheep and cattle raised There are few minerals and no important manufactures Fishing is carried on, and there is some export of timber There are several mineral springs and Pau is a famous health resort seaside resorts are Biarritz and St Jean de Luz Area 9 880 sq m pop (1931) 4 3 000

**Bassoon**, see ORCHESTRA

**Bassorah**, Battle of (663) the Moslems under Caliph Ali defeated a superior force of rebel Arabs under Telha and Zobin both of whom fell Seventy men held in succession the bridle of the camel on which Ayesha (widow of Mohammed) who had espoused the rebels cause sat and were killed in the struggle The victory is still known by the Moslems as the Day of the Camel

**Basso-Relievo**, a technical term in sculpture for carving in low relief—originally applicable only to designs that projected less than half the full width of the object portrayed In some Egyptian work the design remains level with the original surface the background being cut away to a slight depth The Assyrian lion hunts and the Parthenon friezes in the British Museum are examples of Basso-relievo

**Bass Rock**, islet at the mouth of the Firth of Forth containing a famous lighthouse Was at one time used as a prison for Covenanters and saw the last stand of the Jacobites against William III Area c 6 acres

**Bass Strait**, in the Pacific, separating Tasmania from Australia, named after George Bass surgeon of the ship *Reliance* who in 1796 accompanied by Flinders then a midshipman in the same ship crossed it in an open boat Later they sailed round the island in a small vessel the *No folk*

**Bast**, The fibre of the inner bark of the lime and other trees The European lime tree (*Tilia europaea*) is called the bast tree Bast is also made from the bast palm (*Attalea funifera*) and from various plants the inner bark of which is of a fibrous nature Used as a tying material and for ornamental work

**Bastard**, an illegitimate child one born out of wedlock In England canon law did not allow a child to remain a bastard if the parents subsequently married but a proposal by the bishops to introduce this provision into the law of England was rejected by Parliament in 1235 Not until 1927 was the position changed in that respect by the Legitimacy Act of 19 6 an illegitimate child is legitimised by the subsequent marriage of his parents provided that at the time of the birth neither of the parents was restrained from marriage by a legally subsisting marriage with another The child of a married woman is presumed to be legitimate but this presumption can be disproved by proof that the husband could not have been the father Any direct evidence of access or non access may be given but neither husband nor wife is as a matter of public morality allowed to give any evidence proving or tending to disprove the fact of sexual intercourse though other witnesses may give such evidence And a spouse is always at liberty to prove separation impotence etc at the time of conception The question of legitimacy if it arises in legal proceedings e.g. in a claim as heir at law may be settled by the court Further any person who is a natural born British subject or whose right to be considered a natural British subject depends wholly



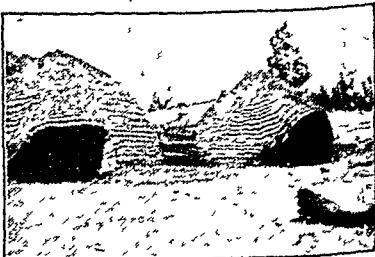
his legitimacy or the validity of any marriage, may, if domiciled in England or Northern Ireland, or if he claims any real or personal estate in England, apply by petition to the High Court for a decree declaring that he is the legitimate child of his parents

The position of a bastard does not differ greatly from that of a legitimate child, except in respect to inheritance. At Common Law he could take no property as heir except as heir to his own legitimate children, neither could he have any heirs except legitimate children. Since Jan 1, 1927, however, he may inherit from a mother who dies wholly or partly intestate leaving no legitimate issue surviving, and his legitimate children may similarly inherit through him. Since that date, too, the mother of a bastard, if surviving, is entitled to take any property not disposed of by will by the deceased illegitimate child, subject to the rights of a surviving spouse of the latter. He has no surname by inheritance, but may acquire one by reputation. He cannot be compelled to support his parents, but the Workmen's Compensation Act, 1925, gives him the right to receive compensation for the death of either parent or grandparent in cases within the Act, and on similar principles, his parents or grandparents have a right to compensation for his death. The mother, so long as she is unmarried or a widow, is bound to maintain the child until it reaches the age of sixteen. In all respects her rights are those of the mother of a legitimate child. The father is under no obligation, in the absence of an affiliation (*q v*) order, or unless he has adopted the child in fact or by an adoption order, but he may make a contract with the mother for its maintenance. Neither has he any right to the custody of the child during the life of the mother. The husband of any woman is bound to maintain her bastard children born before the marriage, until they are 16 years old or the mother dies, but he is not bound to maintain a bastard born after the marriage.

**Bastien-Lepage, Jules** (1848-1884), French painter, is best known for his pictures of rural life (e.g. *The Hayfield*), which are in the realistic style of the "plein-air" school. His portraits of Sarah Bernhardt and Henry Irving are highly esteemed.

**Bastille**, in military architecture a temporary or permanent detached fort for the defence of a stronghold. The term is best known as applied to the citadel of Paris (corresponding to the Tower of London), built in 1360, enlarged in 1383 and 1553, composed of towers connected by curtain walls. It was converted into the notorious State prison, destroyed at the outbreak of the Revolution in 1789.

**Basutoland**, territory of S Africa,



Basutoland Native Village.

N E of Cape of Good Hope province. The surface is composed of a high plateau, several mountains, sloping downwards on the extreme W. The Quathlamba range forms part of the E border, and runs into the Drakensberg Mountains in the N E. Peaks include Mont aux Sources (11,000 ft), and just over the border Cathkin Peak (12,000 ft). In the centre of the region are the Double Mountains, rising to a height of 10,000 ft. Rivers include the Orange, and Tugela, and several shorter streams.

Much of the land is fertile, and produces good crops of wheat, and maize, as well as large tracts of pasture, where many head of cattle, sheep, horses, and goats are raised. Some coal is mined, and other minerals, as yet not exploited, are iron and copper.

There are no manufactures. Exports consist mainly of wool, wheat and mohair; imports of manufactured goods, agricultural implements and blankets.

Government is carried on by a resident Commissioner under the direction of the High Commissioner for S. Africa. Local government is in the hands of native chiefs. White settlement is discouraged and in places forbidden and the only Europeans (c. 1600) are officials, missionaries and traders. There are c. 600 native schools, but missionary progress is comparatively slow. Communications are very backward. The bulk of the population are Basutos, an intelligent and progressive people. They have been well disposed towards Europeans since the reign of their first important chief, Moshesh.

Basutoland came officially under British protection in 1843, was annexed in 1868, became a part of Cape Colony a few years later and finally (1884) was declared a Crown Colony. The chief native town is Maseru (300). Area 11 720 sq. m. pop. about 500 000.

**Batavia** (1) W. residency of Java, Dutch E. Indies. The surface consists of plains and swamps in the N. but of hills in the S. The district is watered by several short streams and the soil is fertile. Important crops are rice, coffee, tea, vanilla and tobacco. Large coconut and rubber plantations provide most of the exports. Minerals and manufactures are unimportant. Chief towns are Batavia and Meester Cornelis. Buitenzorg and the surrounding country is a favourite health resort. Area (with adjacent lands which are part of the residency) c. 11 600 sq. m. pop. (1925) 1 240 000. 3 000 Europeans.

(2) Capital of Batavia residency and of the Dutch E. Indies on the N. coast of Java. It is a large shipping centre, the port a little distance from the city known as Tandjong Priok, has 3 excellent harbours with modern quays and equipment. Chief exports are rice, sugar, coffee, many kinds of wood,

rubber, various spices, copper, manganese and quinine. Imports are textiles, iron and steel, clothing, tobacco and foodstuffs.

Batavia, when founded in the 17th cent. was extremely insanitary but it has been improved. It fell to the British in 1811 but was returned to the Dutch after the Napoleonic Wars. It is served by Dutch air liners from Europe every week. Pop. (1955) 960 400.

**Bateson, William** (1861-1936) English biologist held important professional positions at Yale and Cambridge. His researches into Mendel's theory of heredity and sex-determination were published (e.g. *Problems of Genetics* 1913).



Bath. The Roman Baths.

**Bath**, city and inland watering place in Somerset on the R. Avon, not far from Bristol. Since the 18th cent. Bath has been one of the most fashionable and successful of English spas; its medicinal baths have been known since the Roman occupation, of which there are extensive remains: baths, altars, temple ruins and a great conduit through which the main modern bath still receives its water. Pop. (1931) 68 801.

**Bath, Order of the**, an order of knighthood founded by Henry IV, which lapsed c. 1670 and was revived by George I. Formally reconstituted in 1815 there are three classes—Knights Grand Cross (G.C.B.), Knights Commanders (K.C.B.) and Commanders

(C B)—each with military, civil, and honorary divisions

**Bath Chap**, pig's check and jaw, dried, salted, and smoked. So-called because the idea was originated in Bath. Chap is an old English word meaning "check."

**Batholiths**, large masses of rock, rising from a considerable depth in the earth's crust, and intruded into overlying strata. They are usually found in folded mountain-ranges. One view regarding them is that they eat their way through the beds overlying them, another that they follow definite lines of weakness, absorbing little of the native rock, a third view is that both these conditions are fulfilled, the batholiths being termed "discordant" and "concordant" respectively.

Huge batholiths occur in the pre-Cambrian rocks. One in Quebec is 5800 sq m in extent, and 17 in Labrador cover between them an area nearly equal to that of England.

**Bathos**, see ANTICLIMAX

**Baths**. The practice of immersing the body in some substance such as water or mud for purposes of cleanliness and health has existed from the earliest days of human history. Recent discoveries at Knossos have revealed that in the King's palace at least domestic plumbing had reached a relatively high standard, and supplies of hot and cold water were laid on to the bathroom.

In Rome baths reached a high pitch of luxury. The system employed was to have a hot bath, then to enter a heated room which caused the body to perspire profusely, and to finish with either a cold bath, or a plunge into a swimming-bath. Some of the Roman baths were equipped with gardens and lecture rooms, and were open to both sexes, forming what would nowadays be termed social clubs. This system of public baths fell into disrepute during the Dark Ages, and came under the official ban of the Church, as it was supposed to tend to immorality.

In W. Europe, from then until the

19th cent., bathing ceased to be a regular practice, even among the aristocracy. Moreover, washing was not indulged in very freely, and no provision was made even in palaces for the provision and disposal of water.

In Russia and Finland, probably by imitation from Constantinople, vapour baths have for long been popular among all classes. These consist of a bathhouse, heated by a stove, to produce perspiration, sometimes with provision for a cold shower, or else so situated that a swim can be taken immediately after leaving the bathhouse. In some parts of Russia one of the processes was beating the body with birch twigs.

In England, Beau Brummel is said to have introduced the custom of cold baths at the end of the 18th cent. This habit was taken up by the Prince Regent and his entourage, and being approved by the leaders of fashion, spread gradually down the social scale. Houses, however, still continued to be built without bathrooms. In the middle 19th cent. public baths and washhouses began to be built, and later on, swimming-baths, first indoor, and later outdoor, were built in increasing numbers. During the present century bathrooms have been automatically included in new houses, and much engineering skill has been devoted to facilitating a good and constant supply of hot water.

Bathing, too, has become increasingly popular. In addition to freshwater swimming-baths, sea bathing, mud baths, sun baths, brine baths, and various kinds of medical baths, as at spas and mineral springs, are used increasingly by all classes, with a corresponding rise in the standard of public health.

**Bathstone**, a soft limestone, quarried near Bath for building purposes. It is oolitic in character, and crumbles easily.

**Batik** [BAHTIK'] means a particular method of dyeing cloth, the word being Javanese for wax-painting. No date can be fixed for the invention of the

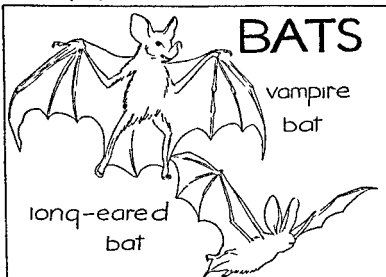
art which appears to have existed in Java from the most ancient times and may have originated in China or in India. Practically all the clothing worn throughout Indonesia is made of cotton (or occasionally of silk) dyed in this way. The method consists of painting the pattern on the cloth with hot wax covering all the parts which are to remain undyed. The cloth is then dipped in dye and after drying the wax is removed. As a number of colours are frequently used or different

Europe and America led to the production of a quantity of scarves and hangings ornamented by this method.

**Bat Louse** a small long legged wingless fly (*q*) parasite on bats of various kinds and particularly abundant in tropical Asia.

**Batrachia**, see AMPHIBIA.

**Bats**, mammals of the order Chiroptera distinguished from other mammals by having the fore limbs converted into wings. These wings enable swift and sustained flight and are formed



shades of the same colour the coating with wax has to be repeated several times the cloth being dipped successively in the different dyes. The patterns and colours used vary from district to district and are traditional the painting being done by the women although the men assist in the elaborate preparation of the cloth.

Javanese sarongs (the garments worn rolled round the body under the arms and reaching to the ankles) are frequently very beautiful and a few years ago a veritable craze for batik in

by a thin naked membrane stretched between the limbs and the body and between four of the greatly lengthened fingers of the hand.

The feet and the thumb however are free and are provided with sharp claws by means of which bats can crawl the claws of the feet being especially useful for suspending the animal head downwards when at rest.

The popular idea that bats cannot see is incorrect. It is true however that they are less dependent on sight than many animals because the sense

of touch especially in the wings and ears is very highly developed. Bats have been blinded and released in a room across which strings had been stretched, yet they managed to avoid contact with them while flying.

Bats are nocturnal, and in cold countries hibernate.

There are two main groups of bats, the fruit-eaters and the insect-eaters. The former, also called flying foxes, are larger than the insectivorous forms, the largest, from Malaya, having a wing-spread of 5 ft. Flying foxes have tubular ears and flat-crowned teeth, and are confined to the tropics of the E. Hemisphere, where, in many places, vast hordes attack the fruit trees and cause much damage.

The insect-eating bats, of which there are many kinds, are found in all temperate and tropical countries. They are smaller, with spreading ears and sharply pointed teeth, and some, like the vampires, are blood-suckers. Their cry is of such a high frequency as to be inaudible to most human ears.

**Battalion**, an infantry unit consisting in wartime of 1000 men and 96 officers, this being taken as the largest number controllable by one man. It is normally composed, in the British Army, of four companies, one of which is a machine-gun company, and a head-quarter wing, the whole unit being commanded by a lieutenant-colonel.

**Battenberg**, former family name of the descendants of the morganatic marriage (1851) of Alexander of Hesse, whose eldest son, Prince Louis of Battenberg, became in 1917 Marquess of Milford Haven (*q v*) and adopted the surname Mountbatten. The second son, Prince Henry of B (1858-96), married Princess Beatrice, a daughter of Queen Victoria, his daughter is the ex-Queen of Spain, and his son the present Marquis of Carisbrooke (*q v*).

**Batter**, To make.

4 oz. flour  
1 egg  
 $\frac{1}{2}$  pint milk  
 $\frac{1}{2}$  pint water } or  $\frac{1}{2}$  pint milk  
Salt

Sieve flour and salt. Make hole in centre, add eggs unbeaten, mix gradually with flour. Then beat well until the mixture is smooth. Stir in the milk a little at a time. Beat thoroughly, allow to stand an hour or so.

**Yorkshire Pudding**. Pour batter (as above) in a shallow tin, in which  $\frac{1}{2}$  oz. dripping has been made smoking hot. Bake 45-60 minutes in a hot oven (450° F). Cut in squares.

**Pancakes**

$\frac{1}{2}$  pint batter as above

Castor sugar

Lard

Lemon juice

Heat lard, and pour a little in frying-pan, which has been proved (*see* FRYING-PAN), heat until smoking hot, pour off, first leaving pan well greased. Pour in sufficient batter to cover the bottom. When this is set and slightly brown underneath, toss and fry the other side. Turn out on to sugar on paper. Squeeze a little lemon juice in the centre. Roll up and keep hot.

**Fritters**, *Apple*. Use batter as above. Peel and core 2 or 3 apples, cut in slices, and dredge with sugar. Dip in batter and fry in deep fat (*see* FRYING).

**Batter Cases** are used for holding small savoury mixtures for entrées. A somewhat thick pancake batter (*see* above) can be used. Dip batter mould into smoking hot fat, and then into batter about three-quarters of the way up. Fry until golden brown. Slip case off mould and fry a little longer. Drain and fill with savoury mixture.

**Battering-ram**, a large beam, capped with heavy metal, and either suspended from a frame or supported on wheels, used by the Romans and others to make a breach in the wall of a besieged town or castle.

**Battery**, *see* ARTILLERY.

**Battery (Electric)**. Every electric battery consists of three essential parts, two electrodes or plates of different material, either metal or carbon, dipping into a liquid. Sometimes two liquids

are separated from each other by a porous partition and one of the electrodes dips into each liquid. The Edison Lalande cell consists of a zinc plate and a plate of copper oxide dipping into caustic soda solution. Zinc tends to go into solution in caustic soda with the formation of zinc ions (see ELECTRO-CHEMISTRY) while since each atom of zinc carries an electric charge with it this reaction tends to cause a current to pass through the cell from the zinc plate to the liquid. This current has to pass from the liquid to the copper oxide plate and if this plate were made of carbon hydrogen gas would appear on it. This hydrogen gas would require energy to separate it and would also coat the plate and tend to stop the current. Instead the copper oxide is reduced to copper with the formation of water and this also helps the current to pass. The result is that this battery delivers a steady current and is one of the best of the wet types.

In the Leclanché cell the copper oxide plate is replaced by a carbon rod coated with manganese dioxide and the liquid used is a solution of sal ammoniac. The manganese dioxide is usually mixed with carbon or graphite to make it electrically conducting. Its manufacture now forms an enormous industry.

The most important electric battery is the accumulator. Theoretically the reactions taking place in any battery are reversed when a current is sent through it in the opposite direction to that in which it delivers current. There are only two or at the most three satisfactory types of accumulator. The oldest of these is the lead accumulator which consists essentially of plates of spongy lead dipping into sulphuric acid. When a current is passed through this hydrogen is evolved at the negative pole while the lead of the positive pole is oxidised to peroxide. If the current is now stopped the cell will deliver a current in the course of which the lead plate becomes changed into lead sul-

phate part of which goes into solution while the positive plate is reduced to lead in exactly the same way as the copper oxide was reduced to copper in the Edison Lalande cell. In actual practice it is usual to construct the plates by starting with lead peroxide for the one and litharge or spongy lead for the other.

The most serious drawback to the lead accumulator is its sensitivity to bad treatment. If it is allowed to stand discharged quite a short time the positive plate is attacked by the acid and converted into sulphate which becomes crystallised as does the sulphate in the negative plate. The capacity of the accumulator however obviously depends on the plates having their active material in a very fine state of division and hence a sulphated accumulator though the chemical changes can be reversed by recharging several times never regains anything like its former capacity. The other accident to which any accumulator is subject is short circuit. This produces disastrous results in lead accumulators causing the plates to buckle and the filling to be loosened.

Both these drawbacks are removed by the Edison accumulator in which the metals are iron and nickel the liquid used being caustic soda. Unfortunately the voltage of each cell is only half that of the lead accumulator and hence a battery is hardly any lighter considerably more bulky and also more expensive than a lead battery. It is however practically fool proof the electrodes being made of thin welded steel and the containing vessels of heat nickel. In spite of the advantages of the Edison cell the lead accumulator is in almost exclusive use. In its present form it is the result of an immense amount of research.

**Battery (law)** see ASSAULT

**Battle**, small Sussex town c. 10 m. N.W. of Hastings with the remains of the abbey founded by William the Conqueror to commemorate his victory in 1066 whence the town's name. Pop (1931) 3400.

**Battle**, an action between two or more armies, or navies. A *skirmish* denotes the engagement of small sections only, a *partial battle* that of a portion of the available forces. Single battles may prove turning-points, not only in a campaign, but also in a nation's history, and the defeat of the Moors at Tours (732) and of the Saxons at Hastings (1066) may rank in this category. In mediæval times 10,000-30,000 men were normally engaged in battles, but at Sadowa 400,000, and at Ypres about the same number, took part.

**Battleship**, see NAVY.

**Batum**, chief town of the Adzhar republic of the U.S.S.R., lying on the Black Sea, in the extreme SE of Russian territory. Its main importance is as an oil-exporting centre from the Baku fields, the oil being brought by pipe-line and by rail. Pop. (1926) 45,500.

**Baudelaire** [BŌDLĀR], **Charles Pierre** (1821-1867), one of the best known of French poets. His manner of life was such as to bring him very quickly to the verge of poverty and to inspire in him a revolt against the accepted moral canons and an active antagonism to the general mentality of the bourgeoisie that he expressed in poems collected under the title *Fleurs du Mal* ("Flowers of Evil"). Baudelaire was one of the first to appreciate fully the genius of Poe (*q.v.*), whose *Tales* he translated with extraordinary felicity. His other works were various critical studies, *Petits Poèmes en Prose*, and letters to his mother.

**Bauer, Harold** (b. 1873), English-born pianist, who first appeared in public as a violinist "prodigy." On Paderewski's advice he went to study in Paris, and while there took up the piano. He made successful appearances in America as pianist at the beginning of the century, and is now in the front rank. He is a naturalised American.

**Baum** [pron. BŌUM], **Vicki** (b. 1888), German novelist and editor of *Die Dame*. Her novels include *The*

*Secret Sentence* (1932), and are notable for their minute characterisation.

**Bautzen**, industrial town of Saxony on the R. Spree, c. 30 m. E. of Dresden. Chief products are metal goods, especially aluminium, woollens, leather, machinery, and paper. The town dates back to the 10th cent., has a 15th-cent. cathedral, and was the scene of battles between Napoleon and the allied Russians and Prussians, 1813. Pop. (1925) 40,300.

**Bauxite**, an earthy mineral, composed of aluminium oxide combined with water. Found in yellowish white or reddish-brown masses, resulting from the decomposition of volcanic rocks or granites by alkaline waters. Often formed under tropical conditions. It occurs in Antrim, at Beau in France, and in the United States. It is important as the source of aluminium, of which it is the chief ore. It is also used as an abrasive, and in brick-making. A variety, known as laterite, occurs as a decomposition product of the basalts of the Deccan, and in other tropical countries.

**Bavaria** [*Freistaat Bayern*], German republic bounded N. by Thuringia, S. by the Austrian Tyrol, W. by Württemberg, and E. by Austria and Czechoslovakia. The surface, composed of the Tyrolean Alps in the S. (Zugspitze, 9800 ft.), and Böhmer Wald in the E., slopes steadily N. and NW. towards the plains of lower Franconia. Bavaria also includes the detached Palatinate (Pfalz) situated on the NW. of Baden. The chief rivers are the Main, the Danube, and its tributaries. About half the total area is devoted to wheat, rye, oats, barley, vegetables, grapes, and hops, and pasture lands for horses, cattle, pigs, and sheep. Coal yields annually c. 1½ million tons and iron ore c. 300,000 tons. Dairy farming and forestry are carried on. The chief industries are brewing, hardware, engineering, and paper-making. Munich, Nuremberg, Augsburg, Ludwigshafen, Regensburg, Fürth and Bamberg are

of 193 members elected by popular suffrage and by a cabinet. Early in 1933 the Nazis (German National Socialists) took over the government and a Nazi Police Commissary with several Nazi members of the Cabinet replaced the Government. Elementary education is free and compulsory and there are universities at Augsburg, Bamberg and Munich.

**History.** Occupied in turn by the Romans and Franks, Bavaria became the most important State of the E. Frankish empire and by the 10th cent. was virtually independent. Barbarossa bestowed it on Ott. of Wittelsbach (1180) and it was ruled by his descendants till 1918. In 139 the duchy was partitioned among the sons of Stephen (5th in descent from Otto) but was reunited 1465 under Albert II (4th from Stephen). Maximilian was created Elector 1623. In 17 the senior line died out and the duchy passed to the junior branch which had ruled the Palatinate since 1394 and in 1805 Napoleon made Bavaria a kingdom. During the Napoleonic Wars Bavaria was invaded by the French and signed a treaty of alliance against Austria. At the beginning of Napoleon's decline this treaty was rescinded and Bavaria joined the Allies against him. The subsequent peace established the territorial boundaries of Austria and Bavaria. The formation of the German Zollverein (customs union) and Bismarck's efforts to unite Germany culminated in the Austro-Prussian War in which Bavaria sided with Austria and shared her defeat. Bismarck's moderation in the peace terms brought about a change in Bavarian policy and following the Franco-Prussian War the State willingly entered the German union with certain nationalist reservations.

After the World War Kurt Eisner (qv) formed a revolutionary Government which deposed the dynasty. Eisner however was assassinated and subsequently a new constitution in force till the advent of the National Socialists (1933) was promulgated.

Area 9 700 sq. m. pop. (1975) 7 379 600.

**Bax, Arnold Edward Trevor** (b. 1883) one of the best known of modern English composers. Born in London he studied at the R.A.M. and had his first work produced in 1903. He has composed a large amount of orchestral and chamber music particularly the *Symphony in E flat* a delightful piano quintet and some piano sonatas.

**Baxter, Richard** (1615-1691) English Puritan divine, learned and moderate in his views, was a chaplain both to the Parliamentary forces and to Charles II. He was a famous preacher at Kidderminster and London until under the Act of Uniformity (1662) he was forbidden to preach and greatly persecuted. Judge Jeffries sentenced him very heavily in 1683 but from 1687 he was left in peace. His writings were numerous and include an autobiography *Reliquiae Baxterianae*.

**Bay** (or *Bay-la-ce*) a species of laurel (qv) of the order Lauraceae which was imported to England from S. Europe where it was used by the ancients as a victor's crown. The bay, an evergreen bush-like tree 6 ft. or more in height is a favourite garden plant; its leaves which have a characteristic aromatic odour when crushed being used for flavouring in cookery while its berries yield a fatty substance employed as an ointment by veterinary surgeons. In America the name is applied to a species of *Myrica* (qv).

**Bayard, Pierre Terrail** (1475-1524) famous French soldier took part in many battles in Italy including Fornovo (1495), Ravenna (1511) and Marignano (1515). He was captured by Henry VIII's army at the battle of the Spurs but quickly set free. Bayard was in command at the famous siege of M'zières which he held against an enormous army. He was killed at the Sesia in the midst of the battle. Bayard is considered the epitome of chivalry: *sans peur et sans reproche*.

**Bayeux**, French town in department Calvados. The cathedral is one of the finest in N. France. Local



**Battle**, an action between two or more armies, or navies. A *skirmish* denotes the engagement of small sections only, a *partial battle* that of a portion of the available forces. Single battles may prove turning-points, not only in a campaign, but also in a nation's history, and the defeat of the Moors at Tours (732) and of the Saxons at Hastings (1066) may rank in this category. In mediæval times 10,000-30,000 men were normally engaged in battles, but at Sadowa 400,000, and at Ypres about the same number, took part.

**Battleship**, see NAVY

**Batum**, chief town of the Adzhar republic of the USSR, lying on the Black Sea, in the extreme SE of Russian territory. Its main importance is as an oil-exporting centre from the Baku fields, the oil being brought by pipe-line and by rail. Pop (1920) 45,600.

**Baudelaire** [BODLÄR], Charles Pierre (1821-1867), one of the best known of French poets. His manner of life was such as to bring him very quickly to the verge of poverty and to inspire in him a revolt against the accepted moral canons and an active antagonism to the general mentality of the bourgeoisie that he expressed in poems collected under the title *Fleurs du Mal* ("Flowers of Evil"). Baudelaire was one of the first to appreciate fully the genius of Poe (*q v*), whose *Les* he translated with extraordinary felicity. His other works were various critical studies, *Petits Poèmes en Prose*, and letters to his mother.

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Government is carried on by a Diet

design is well balanced expressive and rhythmical, and some of the panels particularly those illustrating the Battle of Hastings are full of movement

**Bayezid** *see* HAJAZET

**Bayle Pierre** (1647-1706) writer of the *Dictionnaire Hist rique et Critique* (1695) a kind of critical encyclopædia which had great influence on 18th-cent France

**Bay-leaf**, *see* SPICES AND CONDIMENT

**Bayonet**, a short steel weapon fixed when in use to the muzzle of a rifle or musket, and employed for thrusting. It takes its name from the town of Bayonne where a triangular pointed dagger was made in the 15th cent. These daggers were with little alteration plugged into musket muzzles in the 17th cent. The British bayonet is 12 in long

**Bayonne**, town in Basses-Pyrénées France at the confluence of the Nive and Adour. Pop. (19-6) 27 804. It is enclosed with ramparts and preserves the character of the fortified places of former days. Among the industries are shipbuilding tanning and pottery. The cathedral famous for its cloisters is the only building of note. The museum contains collections bequeathed by the painter Bonnet. Bayonne sustained numerous successful sieges from Plantagenet times (1164) to the close of the First Empire (1814).

**Bayreuth** [bî roîr] Bavarian town situated c. 40 m. E. of Bamberg chiefly celebrated for its musical associations. Wagner lived here in whose honour an annual festival takes place at the theatre built to commemorate him. Other distinguished musicians connected with the town were Liszt and Richter both of whom are buried here. There is a considerable trade in agricultural commodities. Pop. (19-5) 35 300.

**Bazaine François Achille** (1811-1888) marshal of France (1864) served in Algeria the Crimea Italy and Mexico. In 1870 he commanded the army of the Rhine against the Germans

and through his incompetence when he surrendered Metz was largely responsible for the capture of Paris. In 1873 he was court-martialled and imprisoned; he escaped (1874) and died in Spain.

**Bazalgette Sir Joseph Wm.** (1819-1891) engineer to the Metropolitan Board of Works was responsible for the drainage of London (1858-75) and for the Thames Embankment (1860-74).

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**Beachy Head**, S coast headland the most E. spur of the S Downs. It is a short distance from Eastbourne and commands a magnificent view of Sussex. The battle of Beachy Head took place in 1690 between an allied English and Dutch fleet and the French; the result was indecisive.

**Beacon** (O. Eng. *beacen* a sign of *becon*) (1) A signal usually a fire displayed on a high hill or tower to convey messages to a distant point. In mediæval times chains of beacons transmitted news from hill top to hill top across the country and the news of the Armada (1588) was so broadcast. The hills used have in many cases taken the name e.g. Dunkery Beacon (Somerset) Ditchling Beacon (Sussex). (2) An unattended light buoy or fixed coastal signal. *See also* BUOYS.

**Beaconsfield**, market town of Bucks of pleasant 18th-cent aspect the former residence of Walter Burke and other literary figures. Disraeli (qv) on accepting a peerage took his title from this town. Pop. (1931) 4843.

**Beaconsfield, Benjamin Disraeli, Earl of** (1804-1881) English statesman and author of a Jewish family became a Christian in 1817. He entered Lincoln's Inn in 1824 and two years later his first novel *Julian Grey* appeared. Between 1830 and 1837 when he entered Parliament he published seven novels. His maiden speech was shouted down.

industries include lacemaking, and porcelain Pop (1926) 6500

**Bayeux Tapestry** [bly'æ], an 11th-cent piece of needlework, illustrating the Norman invasion of Britain. The tapestry consists of 72 panels (4 having

Tradition ascribes its working to Queen Matilda and her ladies-in-waiting. It was exhibited in Paris in the time of Napoleon, and a coloured reproduction of it was published in 1818 in Stoddard's *Vetusta Monumenta*. A full-



Part of the Bayeux Tapestry

perished) embroidered in coloured worsted on a strip of linen 20 in wide and over 230 ft in length, and is now in the museum of Bayeux, a town in Normandy, some 18 m from Caen. It is believed that the tapestry was worked for Bishop Odo, half-brother of William the Conqueror, and it was used to decorate Bayeux Cathedral

— sized coloured copy exists in the Victoria and Albert Museum to-day. Apart from its tremendous historical importance, since it is one of the few contemporary records of the costumes and life of the time and extremely rich in the details of a variety of activities, the Bayeux Tapestry is remarkable for its purely æsthetic qualities. The

design is well balanced expressive and rhythmical and some of the panels particularly those illustrating the Battle of Hastings are full of movement

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he prophesied that the House would later listen to him, but his affected dress and speech militated strongly against his being taken seriously. He bided his time. His speeches on the Chartist Riots of 1839-40 showed promise, in 1842 he became leader of the Young England Party, and in 1846, his bitter attack on Sir Robert Peel over the Corn Laws made him leader of the Conservative Party in all but name.

Meanwhile, *Comingsby* (1844), *Sybil* (1845), and *Tancred* (1847) appeared, the last causing him some unpopularity which divided the party's allegiance to him. As Chancellor of the Exchequer under Lord Derby in 1852 and 1858 he did not distinguish himself, but in 1867 the famous Reform Bill, that "dished the Whigs" by exceeding even their franchise proposals, made him certain to succeed Derby as premier. *Lothair* appeared in 1870. During his ministry of 1874-80 he reached the zenith of his power, the acquisition by Britain of half the shares of the Suez Canal (1875), the proclamation of Queen Victoria as Empress of India (1876), and the Berlin Congress (1878) were his great achievements of that period. *Endymion* appeared in 1880, and on April 19, 1881, Beaconsfield died.

His contribution to the Conservative cause was in the less tangible realm of personality and influence, attested by the continued existence of the "Primrose League," named after Beaconsfield's favourite flower. His Jewish sensibility and *flair* for effect were well suited to politics, and his treatment of Queen Victoria showed a deep appreciation of character. His novels, which were extremely popular and widely imitated in his day, are little read now, though they offer a brilliant picture and analysis of the society and politics of the period.

Beadle, originally a Saxon officer who summoned householders to council, latterly a parish constable, in the Scottish Church one who attends the minister during divine service.

**Beads:** (1) Beads play an important

part in the life of most primitive people, both for adornment and for barter. Coloured seeds and shells and the pierced teeth of mammals or sharks, strung on fibre, are probably among the earliest forms of jewellery known to mankind. In all ancient civilisations elaborate bead ornaments appear to have been worn by both men and women, such as the intricately threaded necklaces found in Egyptian tombs and among the ruins of Babylonian, Greek, and Roman cities. Pottery, clay, precious stones, wood, glass, metal, carved ivory and amber—every possible known substance was used for this purpose.

In modern Europe, Venice became an important centre for the manufacture of glass beads, and this industry was greatly stimulated in England and elsewhere by the demand for this means of barter with primitive races, particularly in the days of the slave trade.

In the manufacture of glass beads, balls of blown glass are drawn out into tubes of the required thickness; they are then chopped into short lengths which may be used in this shape as *bugles*, or rotated in a cylinder with sand and ashes over a furnace until they become spherical.

(2) In architecture and cabinet-making the term used for the fine moulding consisting of a series of small round bosses.

**Beadwork**, decorative trimmings in beads. It is not so much used now as in the past, as bead-lace trimmings for dress and bead-embroidered stool tops and fire-screens have gone out of fashion, but there are still some very fine examples of old bead-embroidered bags to be seen. In these the beads are so small that the effect is more of tapestry embroidery than beadwork. Beads are used now chiefly as fringes, tassels, or diamond trimmings. They can be knitted into bags, etc.

**Beagle**, the smallest of the true hounds, standing from 15 to 20 in. high, is a breed of great antiquity, and was as popular in the Middle Ages

as now Beagles hunt in packs like foxhounds the hare being the quarry and are followed on foot

**Beam, White**, a tree common on chalky or limestone soils distinguished by its very large egg-shaped leaves which are deeply and irregularly serrated and remarkably white and silky beneath. Flowers are white and borne in corymbs in June. The plant belongs to the rose family and is a close relative of the wild pear mountain ash and medlar

**Bean** a large number of plants come under this heading the chief of these being food plants. The garden bean may be put into three classes and again subdivided into others. The broad bean is sown in the autumn and provides pods for gathering in the early summer. There is a section represented by the Early Mazagan that produces very early beans. Broad beans require a deep rich strong soil well and deeply manured. The runner bean is not hardy and seeds are not sown until May. The dwarf or kidney bean is of the same category. The culture for both may be considered practically similar the requirements being a rich deep loamy soil or a well manured light soil and plenty of moisture. There are several varieties of each bean. The French kidney *Le Flus Ultra* is a kind that is used for forcing in glasshouses for an early supply. The haricot and butter beans have special garden interest the former provides both pods and the dried seeds for food and the latter having no stringy membrane can be cooked without preparation. There are also tall growing butter beans. The runners may be kept dwarf by pinching out the tops as they grow. There is also a variety of the runner bean with pods of great length and a climbing French kidney bean. In dry seasons runner beans often fail to set pods this can be remedied by copious water applications. Pests usually black fly (bean aphid *g v*) attack both runner and dwarf beans and are usually the result of bad culture

**Bean Aphis**, an insect which causes the black masses of blight frequently seen on broad beans and a number of other plants such as field bean rhubarb spinach thistles goosefoot and dock. These masses consist of the progeny of a single winged female. The life history is curious. In late summer winged females migrate from the beans to the spindle tree and produce wingless egg laying females which pair with winged males from bean colonies and lay eggs on the spindle tree. These hatch in spring and give rise to wingless females which produce living young without the intervention of the male. Among these winged individual eventually appear and fly to the beans where further generations of both winged and wingless females are born. Males appear only in the autumn.

The pest causes much damage sucking sap from the plants and lowering their vitality. The intensity of attack appears to be related to soil conditions and manurial treatments but is not yet fully understood. Spraying is the only feasible method of control. Nicotine or paraffin and soap prays should be used.

**Bear** *see* STOCK EXCHANGE BEARS

**Bear-baiting and Bull baiting** brutal sports once popular but now illegal in which the baited animal was chained to a stake and worried to death by dogs who often suffered severely in the process. Animal baiting was suppressed by the Puritans during the Common wealth but flourished again after the Restoration though John Evelyn's *Diary* shows that educated opinion was beginning to be disgusted with the brutality of the performance. It was finally prohibited by law in 1835.

**Bearberry** *see* ARCTOSTAPHYLOS

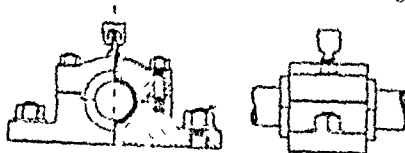
**Beardsley Aubrey** (1856-1898) English black and white artist whose unconventional, sometimes fantastic illustrations to *Le Mort d'Arthur*, *Salome* and *Volpone* brought him great fame. He was in the forefront of the modern artistic and literary movements of his time and edited the

*Yellow Book and the Story* He was a friend of Arthur Symonds and Oscar Wilde

Bearer Securities, see STOCKS AND SHARES

Bearing Metals, see ALLOYS

Bearings. In applied mechanics a bearing is the support for the moving



Plummer Block

part of a machine. Not only has the bearing to support the moving part, but it has to allow it to perform the motion or motions required of it. The motion may be either of turning or sliding, and the design must be such that frictional losses between the moving parts are reduced to a minimum and the surfaces preserved from wear.

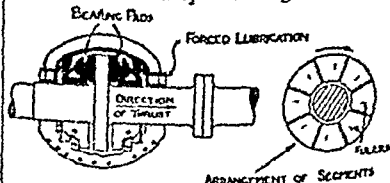
The function of the lubricant in general is to reduce friction and consequential high temperatures as far as possible, thus to avoid seizure of the bearing and stoppage of the machinery.

**Journal Bearing.** A simple form, used to support shafting. The part of the shaft supported by the bearing is called the journal, and this revolves inside the bearing. The ordinary form of Plummer Block is shown in the diagram. It consists of the block proper, to which is attached the sole through which the holding-down bolts pass. On top of the block rests the cap, and between the cap and the block is the brass bush (known as the brasses or steps) which is in halves. The journal revolves inside the brasses, which are made thicker at the bottom to allow for the wear which will take place there. The brasses are prevented from rotation by lugs which enter corresponding recesses in the block cover. Fitting straps are provided for adjustment of the brasses, the usual amounts of permissible clearance being

from  $\frac{1}{16}$  in in small bearings up to  $\frac{1}{8}$  in in large bearings. In the block illustrated lubrication is by a needle lubricator; narrow grooves  $\frac{1}{16}$  in deep are cut diagonally across the top half of the brass to carry lubricant all along the journal.

**Bearing Pressures and Bearing Metals.** Bearings may have to withstand pressures up to 2 tons per sq. in., heavier pressures usually being accompanied by low speed. The material of the brasses must be able to withstand both the pressure and heat evolved. Brasses are usually of alloys, and are divided into two main classes: (a) bronzes carrying over 50 per cent and usually 65-80 per cent. of copper, (b) white metals containing tin, lead, or zinc as the main constituent. The bronzes are harder and stronger than the white metals and are used to resist heavier pressures. They cannot conform easily to any irregularity in the surface, or absorb foreign particles in the bearing, and are liable to heat up under abnormal conditions. White metals, being softer, can adapt themselves to irregularities, and are consequently known as anti-friction metals. Sometimes the bronzes are coated with white metal where pressures are high, this is known as babbiting, the tin-antimony-copper-facing alloy as babbit metal.

**Thrust and Step Bearings.** Thrust



Nichell Thrust Bearing

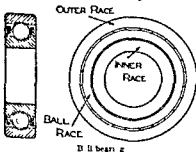
bearings take up longitudinal thrusts on shafts, and step bearings vertical thrusts. On light shafting collars are sufficient to take up the pressure, but where the pressure is heavy, as in the horizontal thrust from the propeller of a ship where the force must be transmitted to the hull, the thrust bearing

is either a horse-shoe bearing or in modern practice the Nichell bearing

**Sliding Bearings** Sliding bearings are found in the slide rests of lathes and the slide bars of steam-engine crossheads. Lubrication is usually direct or by pads although on large steam engines reservoir lubrication is used and forced lubrication on cross-head type Diesels

**Ball-bearings** The sliding friction of the ordinary journal bearing is replaced by rolling friction in the ball bearing. The friction loss in a ball bearing is about one-tenth of that of a good journal bearing consequently where power is expensive and especially with light fast running machinery ball bearings are employed. Ball bearings are very extensively used nowadays especially in automobile practice

**Roller bearings** Roller bearings are used to carry loads too heavy for ball bearings of a reasonable size. Rollers should not be long compared with their diameter and in long bearings rollers are placed end to end each set separated from the next by a washer



Roller bearing

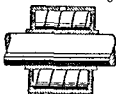
In the Hyatt roller bearing the roller is a truly ground helical spring which owing to its elasticity can bend from the parallel position. This type runs satisfactorily even if of some length

**Barrel bearings** Barrel bearings occupy an intermediate position between ball and roller bearings. The rollers are tapered at both ends and the races are ground to receive them

The area of contact being greater barrel bearings withstand greater pressures than either ball or roller bearings

#### Ball thrust bearings

Ball thrust bearings take longitudinal as well as radial pressures. They are made with grooves of V section or



Hyatt roller bearing

as is the case of the bicycle wheel. For greater pressures thrust washers must be employed

**Bearn**, at one time a province of France having Pau as its capital now absorbed in the Basses Pyrénées. After many changes it passed in 1290 to the house of Foix in 1360 (Treaty of Breigny) to England and in 1550 to the Bourbons. Henry IV annexed it to the French Crown in 1594 and just before Waterloo it was occupied by the British

**Bears** are large heavily built plants grade short tailed mammals forming the family Ursidae. There are eight well marked existing species

One of the largest is the Polar or Ice Bear of the Arctic regions distinguished by its wholly white coat and inability to climb. It feeds on seals fish and stranded whales adding to these during the summer a diet of berries of various kinds. A large male is about 4 ft high up to 9 ft long and weighs about 600 lb

The Brown Bear found in Europe Central Asia and Alaska is generally smaller than the Polar bear but some of the Alaskan specimens are even larger measuring as much as 10 ft long. The colour varies from black or brown to reddish or silvery

The Grizzly Bear of America of which there are several races found principally in the Rocky Mountains is closely allied to the brown bear which it resembles in diet. Both will kill and eat other animals but feed mostly on vegetable matter eating in the autumn large quantities of acorns and



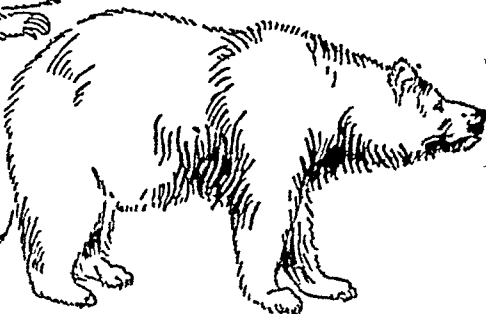
# BEARS

grizzly bear.....



...sloth bear

brown bear.....



...musquaw or black bear

polar bear...



beechmast before retiring for their winter sleep. A smaller species the N American Black Bear which is about 5 ft long has similar habits. The cinnamon bear is a pale variety of this species.

Quite distinct from the foregoing is the Himalayan Black Bear which ranges from Baluchistan to Japan. It weighs about 250 lb but seldom exceeds 5 or 6 ft in length and apparently does not hibernate.

The Sloth Bear of India and Ceylon is about the size of the Himalayan bear but differs in having a longer shaggy coat protrusible lips and a very extensible tongue used for licking up white ants. It also feeds largely on honey sugar-cane fruits etc.

The Honey or Malayan Bear found in Burma Siam Sumatra and Borneo is the smallest Old World species measuring 4 ft in length. Its tongue is like that of the sloth bear but the coat is short and sleek and the ears small and rounded.

Lastly there is a peculiar species the little Spectacled Bear of the Andes so-called from the pale rings round its eyes. This is only about 3½ ft long.

The extinct Cave Bear was the largest known species extending slightly the Alaskan brown bear in dimensions. It was a contemporary of the mammoth and early man in Great Britain and the rest of Europe.

**Beatification**, a process preliminary to canonisation (q.v.) in the Roman Catholic Church by which persons who have exercised the virtues of faith hope and charity to a heroic degree are proposed for the veneration of the faithful. The Blessed are distinguished from the Saints by the fact that their cultus is local only and that churches may not be dedicated to them.

**Beatty David**, 1st Earl (b. 1871) Admiral of the Fleet. From the Royal Naval Academy Gosport entered the training ship *Hibernia* in 1884. He distinguished himself in Egypt and the Sudan (1896-8) and again in the Boxer Rising of 1900. He became

Rear Admiral (1910) and in 1913 commanded the battle-cruiser squadron which in 1914 was successful in the raid on Heligoland and the fight off the Dogger Bank. As Vice Admiral (1915) he defeated von Hipper at the battle of Jutland (1916). From then until 1918 he was Commander in Chief of the Grand Fleet and the German fleet surrendered to him at Scapa Flow. In 1919 he was raised to the peerage and made Admiral of the Fleet and First Sea Lord C.C.B. and O.M. as



Earl Beatty

as well as being given a gratuity of £100,000. He served as First Sea Lord from that date until 1917 when he became a member of the Privy Council.

**Beauchamp** [BE CHŪM] ancient English family founded by Walter de Beauchamp combined by the marriage of Wm. of Elmley with the Warwick heiress with the earldom of that county (1168). Guy Beauchamp the black cur of Arden was a great opponent of Gaveston and Edward II. Thomas his son was imprisoned in the Tower of London, giving his name to the

Beauchamp tower. The earldom of Warwick passed into the Neville family by the marriage of Anne Beauchamp to Richard Neville, the kingmaker. The present earldom was created 1815.

**Beaufort, Henry, Cardinal** (c. 1377-1417), son of John of Gaunt, Bishop of Lincoln (1398), Chancellor (1403, 1413 and 1421), Bishop of Winchester (1401), held an important political position during the reigns of Henry IV, V, and VI. As Cardinal (1420), he was active against the Hussites. Humphrey, Duke of Gloucester, was his enemy, and attempted to overthrow him, but without success. Henry VI was crowned King of France by Beaufort in 1431.

**Beauharnais, Eugène de** (1781-1821), son of Josephine, wife of Napoleon I, by her first husband, who was executed in the Reign of Terror (1794). Napoleon took great interest in Beauharnais, and advanced his fortunes. He was the emperor's aide-de-camp in Italy and Egypt, and was created prince and viceroy of Italy. In 1806, he married a princess of Bavaria, whither he retired in 1814.

**Beaune** [bō'ni], village off Southampton Water, Hampshire, with the ruins of a Cistercian Abbey founded by King John in 1204, the best preserved parts are the refectory and dormitory of the lay brothers, and part of the monks' brewery. Palace House, the seat of the Montagu family, was formerly the great gatehouse of the Abbey.

**Beaumarchais, Pierre Augustin** Caron de (1732-1799), French playwright, was watchmaker to Louis XV (1753). He experienced much difficulty in getting his two famous comedies—*Le Barbier de Seville* and *Le Mariage de Figaro*—staged on account of their revolutionary character. These plays, full of sparkling wit and gay malice, are best known in their operatic versions by Rossini and Mozart.

**Beaumont, Francis** (1584-1616), English dramatist, collaborator with John Fletcher (1579-1625). Little is

known of either writer's life after they left their Universities (Beaumont, Oxford in 1598; Fletcher, Cambridge in 1596) until they became friends about 1607. In the production of their 20 plays Fletcher is said to have provided "the sail of phantasy" and Beaumont "the ballast of judgment". Apart from their joint plays Beaumont wrote only one masque, Fletcher at least 24 original dramas and several in collaboration with others. Beaumont and Fletcher wrote, among others, *Philaster*, *The Maid's Tragedy*, *King and No King*, *The Knight of the Burning Pestle* (1608-1611). They are known as the originators of the tragic-comedy, but while their poetry and wit are charming, their plots are often fantastic and their characters and situations sometimes indelicate. They were lifelong friends and lived together until Beaumont's marriage in 1613.

**Beaumont Hamel**, French village in the Somme department, conspicuous only by reason of the fierce fighting in its neighbourhood during the battles of the Somme and the Ancre (1916). The position was almost impregnable defended, and the 50,000 men who attacked it under Sir Hunter Weston on July 1 were unable to effect a capture, in spite of great gallantry and endurance. The village was, however, taken by the Highlanders at the battle of the Ancre in Nov., together with its garrison and an important artillery store.

**Beaune** [bōn], town of E. France, in the Côte d'Or department; pop. 12,000. Famous for its wine, and the real centre of the Burgundy trade. During the 17th cent it was a flourishing manufacturing seat, the industry being carried on for the most part by Protestants, who were expelled following revocation of the Edict of Nantes (q.v.), 1685.

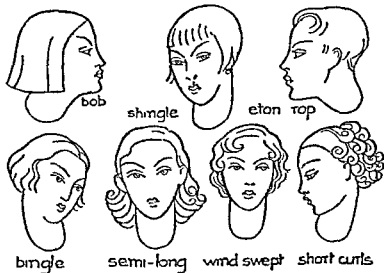
**Beauty Culture**, the science of improving the human form and features. There is a tendency at present for the scientific aspect of beauty culture to develop at the expense of the artistic. It is now realised that the foundation

of beauty is perfect health rather than the application of lipstick rouge etc. A modern development of beauty culture is the use of methods to prevent wrinkles sunburn etc.

**Hair** Permanent waving has of late years become cheaper quicker and more naturalistic. The uniform waves have been replaced to some extent by an artistic coiffure of rows of curls flattened against the head. It is possible too to have part only of the hair waved.

Combing the hair when it is wet pushing it up into waves and fixing them in position with several small combs while drying is very effective with a little practice. Short pieces twisted round and fixed in position with two hairpins are surprisingly easy to curl. Special devices can be bought for this purpose. A fine net placed over the whole head keeps the waves and curls in position while drying.

**Cutting** The long hair era has been



Beauty Culture (Hair—1).

The advantages of permanent over iron waving are many. In wet weather or steamy conditions the perm increases in curliness. It lasts usually for 6 months, and the hair is not made dry and brittle by the application of heat.

**Setting or water waving** is the arranging and drying of the hair in its own natural or permanent waves by applying water or a setting lotion. Many devices have been invented to make this simple enough to do at home

followed by an almost uninterrupted period of short hair since the end of the World War. Various attempts to re-introduce long hair have failed to gain ground. The bob with the cut straight round at the back, the Eton crop cut like a man's, the "shingle," a mixture of the bob and the crop, the encircling outward turned curls have largely given way to a "wind-swept" and flattened-curl fashion. Hair is cut in effectively uneven lengths in the front, and

back is made to curl under by cutting up underneath. A short and slanting parting adds to the attractiveness of this style.

*Care of Hair* Nightly brushing is of the utmost importance to the hair, removing dandruff and scurf, and increasing the circulation, giving it life and lustre, and with naturally wavy hair making it curl. A hundred strokes of the brush nightly, brushing upward, and touching the scalp in part of the stroke, will ensure a healthy head of hair. It can then be brushed downward, parting the hair at inter-



Beauty Culture (Plastic Hair)

vals across the head and dealing with each section separately. A wet comb run through the hair will soon establish order.

*Shampooing* A good pure soap (for dark hair, a pine or pine-tar variety) or some well-known make of soap flakes can be used. The hair should be thoroughly rinsed, and after setting and drying, brilliantine or olive-oil may be applied. A little should be put in the palm of the hand and rubbed on, or applied with cotton-wool to the roots; although a spray applies it more evenly. Oil shampoos, used in a similar way to liquid soap, are gradually

gaining in popularity, and are suitable for dry and greasy scalps. A dry shampoo can be used to avoid disturbing the set of the hair, or if for any other reason it is inadvisable to wash it. A tonic may be used to keep the hair clean between the shampoos.

*Greying hair*, if premature, can sometimes be remedied by massaging the scalp, and by careful brushing. In later years a hair dye tints the colourless strands. It is almost universally agreed that henna remains the safest method of tinting the hair. This can be applied at home by making a paste of the henna with boiling water, and a little vinegar, applying it hot to the hair after shampooing it, and leaving for 3-10 minutes. It is then removed and the hair shampooed again and dried.

*White hair* which has acquired a yellow tinge should be washed with a shampoo containing a blue dye. Ordinary laundry blue in the rinsing water is sometimes effective.

*Scurf* or *Dandruff*, little white or yellowish scales which form on the scalp, due to an infection by bacteria, will develop baldness if not checked in the early stages. The treatment should consist of a thorough shampooing with an alcoholic preparation of soft soap, or a pine-tar liquid shampoo, followed by an application of hot olive-oil. The hair is parted at intervals across the head, and the oil rubbed along it with a pad of cotton wool. In the initial stages of the treatment the brushes should be washed daily.

*Baldness* Massaging in a circular motion with the finger-tips may prove beneficial.

*Greasy hair* needs massaging in order to tone up the oil-secreting glands. A tonic, which usually contains bay rum or some other form of alcohol, will remove greasiness temporarily. Exposure to sun and air whenever possible improves the condition.

*Dry hair* benefits by the application of oil to its roots. Superfluous hair

can be removed by depilatories of a creamy or waxlike nature or by shaving which has a less lasting effect. Hair on the face is most successfully treated by the use of an electric needle by a skilled person. Each hair is removed separately and permanently. Bleaching and softening of the hair with peroxide of hydrogen to which a little ammonia has been added makes them inconspicuous. The application of creams especially with an animal fat as a basis tends to promote the growth of hair. It should therefore be very carefully removed after use and followed by witch hazel extract or some other astringent.

**The Skin** No amount of external application of lotions and creams will permanently improve the condition of the skin unless the body is in a fit condition. Gastric troubles and constipation are often the underlying causes of spots, enlarged pores, blackheads and other skin blemishes. Irrigation to remove impurities from the large intestine and a healthy diet containing plenty of fruit, vegetables with their vitamins, roughage and water form the foundation of all skin treatment. Compressed yeast available at all bakeries has proved of value in striking at the root of one of the causes of skin troubles.

**Wrinkles** Massage with a face cream at night or by an expert tends to remove wrinkles. Unless this is done in moderation, however, there is a tendency for the muscles to sag again as the massage does not then strengthen the muscles but weakens them. A dry skin tends to wrinkle quickly unless supplied with a skin food.

**Packs** consisting of egg or sweet almond oil and tincture of benzoin or fuller's earth mixed to a paste with a liquid consisting of hydrogen peroxide and extract of witch hazel in equal parts, are used to remove wrinkles and impurities from the skin. For special occasions an astringent lotion will temporarily remove wrinkles by closing the pores and tightening the skin.

For face lifting see COSMETICS

**Freckles** can be removed by a little acidified hydrogen peroxide but it is better to leave them as they are a natural preventive against the ill effects of the hot sun rays. If objected to they can be prevented by oiling the skin before exposing it.

**Spots** About 4 pints of water daily, a healthy diet and yeast will remove the cause of spots, boils and blemishes. Perspiration produced by Turkish and other specialised baths (see FIGURE) assists in removing impurities from the circulation. Steam ing of the face will help in the opening of the pores and the removal of the secretion from a boil.

**Blackheads and acne** A solution of soap in ether (obtainable at the chemists) will remove the surface skin. fat friction will loosen the black head and a solution of borax and bicarbonate of soda will help to dissolve the matter of which they consist. Gentle pressing finally removes any remaining traces. An astringent lotion should be used to close the pores.

**Greasy Skin** Washing with a good soap and water twice or three times a day and gentle patting with an astringent lotion at night will improve this condition.

**Dry Skin** A cleansing cream containing oil should be applied instead of washing with soap and water and at night a cream which will supply the skin with the oil which it lacks.

**Rouge** in cream form which will remain unaffected for a considerable time of the exactly correct shade for the person and the occasion should be applied on that part of the face which will best enhance its contours or points. Brunettes require the orange type and the blonde the bluer shade such as crimson. Lipstick should be of the same shade as the rouge and to ensure complete harmony can be applied to the cheeks.

Colour applied along the cheekbone and slightly up on the temple enhances the blueness of the eye. For the lower face it should be concentrated

plateau There are small crops of millet and maize, but they are uncertain, as rainfall is capricious and irrigation comparatively scanty There are small deposits of gold and silver The native races include the Bamangwato, Bangwaketse, and the Bakwena Education is fairly good The chief town is Mafeking Area, protectorate 275,000 sq m, colony 51,000 sq m, pop 153,000 (1800 Europeans) and 100,000 (16,000 Europeans) (1921) respectively

**Becket, Thomas** (1119-1170), Chancellor (1155) and Archbishop of Canterbury (1162) As Chancellor, he made great display of his wealth and power, but on his appointment to the Archbishopric of Canterbury in 1162, he entirely changed his mode of life and conduct His support of the Church against Henry II led to quarrels and ultimately to Becket's flight in 1164 Though he was reinstated in 1170, he again aroused the King's anger, and was murdered in Canterbury Cathedral by four knights, who overheard an impatient remark by the King. His shrine is still the occasion of many pilgrimages to Canterbury He is recognised as a saint by the Roman Catholic Church (day, Dec 29)

**Beckford, William** (1759-1844), son of William Beckford, the immensely wealthy Lord Mayor of London, is best known for his *History of the Caliph Vathek*, written in French, 1782 (English translation, 1786) He travelled widely, and his eccentric habits earned him some notoriety He built two enormous houses, at Fonthill, Wilts, and on Lansdown Hill, Bath He claimed to have written *Vathek* in three days and nights

**Bequerel, Anton Henri** (1852-1908), French physicist who discovered the Becquerel Ray In 1903 he was awarded the Nobel prize See also ATOM

**Beddgelert**, see GELERT

**Beddoes, Thos Lovell** (1803-1840), poet and dramatist, nephew of Maria Edgeworth, is known for the unrelieved gloom of *The Bride's Tragedy*

(1822), an imitation of Webster, and *Death's Jest-Book* (published 1850), and for several lyrics of great beauty. He was a wide traveller, and eventually committed suicide in Switzerland

**Bede, the Venerable** (c 673-735), English historian and divine, of very wide knowledge, wrote the *Historia Ecclesiastica Gentis Anglorum* (731), which contains a wealth of facts, traditions, and legends. It was translated by Alfred the Great into Anglo-Saxon Bede's other works include treatises on theology and the Bible From 682 he lived in the monastery at Jarrow

**Bedford, Earls and Dukes of** From 1550 the titles have been in the Russell family, but before this JOHN PLANTAGENET, son of Henry IV (1389-1436), was created Duke of Bedford in 1413 He was regent for Henry VI, serving in the French wars, during which the siege of Orleans and the martyrdom of Joan of Arc took place He was buried in Rouen Cathedral

**GEORGE NEVILL** (c 1457-1483) was made duke in 1470 and JASPER TUDOR (c 1430-1495) in 1485 The first earl was JOHN RUSSELL (c. 1486-1555), created 1550, he acted as ambassador for Henry VIII and Mary, and founded the wealth and estates of the family

**FRANCIS RUSSELL**, his son, 2nd earl (c 1527-1585) was present at the battle of St Quentin (1557) and, after Elizabeth's accession (1558), held many high positions as ambassador and governor in Scotland and Wales

**FRANCIS RUSSELL**, 4th Earl (1593-1641), supported the Parliament against the King The "Bedford Level" of the fen-district, which he drained, is named after him

The present dukedom was created 1694, and JOHN RUSSELL, 4th Duke (1710-1771), supported Pelham against Walpole, and led the "Bloomsbury gang"

**FRANCIS RUSSELL**, 5th Duke (1765-1802), was succeeded by his brother, JOHN RUSSELL, 6th Duke (1766-1830). See also RUSSELL

# Bedford

Bedford, town, capital of Bedfordshire on the Ouse 50 m. from London pop (1931) 40,872. It is a thriving manufacturing town principally in engineering. There are two fine schools.

Bedford College a college for women attached to London University and situated in the centre of Bedford and Park N.W. It was founded by Mrs. Russell in Bedford Square in 1849 for the provision of a liberal female education. It was then moved to Park Place, Baker Street and while there London to grant degrees to women. A teachers training department was added in 1872 and an art school later. In 1912, the college was moved to new buildings opened by Queen Mary in Russell's Park, and in 1927 an important library was added.

Bedfordshire, English county, 50 m. N. London. Bounded N. by Northamptonshire, E. by Essex, W. by Buckinghamshire and S. by Hertfordshire. In the extreme E. and a low chalk hills, but the greater part of the county is flat and fertile. It is drained by the Ouse and its tributaries to the E. and west of the line.

Most of the county is a rich fertile agricultural land and the soil is mostly clay. There are some upland moorland areas and some small areas of heath. The county is mostly a rich fertile agricultural land and the soil is mostly clay. There are some upland moorland areas and some small areas of heath. The county is mostly a rich fertile agricultural land and the soil is mostly clay. There are some upland moorland areas and some small areas of heath.

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Bedford, the London county historic station, properly called Bedfordshire Royal Hospital founded in 1517 as a priory and later converted into a house for the insane. The hospital has now been moved to Berkhamstead, Kent.

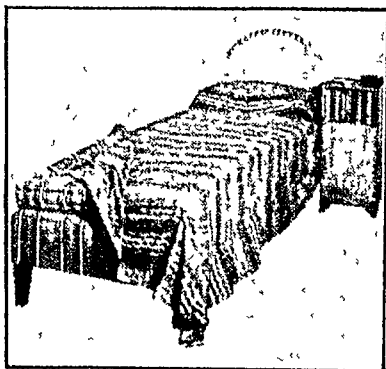
Bedfordshire, a district level of dry weatherable limestone to a height in its highest part, but mostly and long level. It is known for its ancient quarries from a distance. Bedfordshire is a rich fertile agricultural land and the soil is mostly clay. There are some upland moorland areas and some small areas of heath. The county is mostly a rich fertile agricultural land and the soil is mostly clay. There are some upland moorland areas and some small areas of heath.

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Divan Bed

special spring type is durable and comfortable, and special brushes are made for keeping the springs free from dust. The box-spring mattress, of the spiral-spring type, is also of good quality, and of practically everlasting wear. Modern mattresses are frequently made deeply recessed into the bed-frame, thus avoiding the high bed associated with the old-fashioned box-spring.

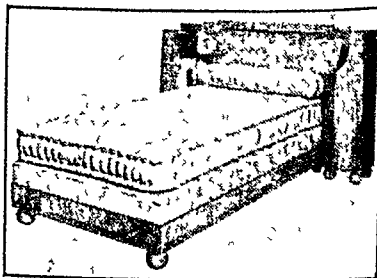
With regard to overlay mattresses, all-hair filling, or hair with a certain amount of wool, is the best, owing to its resiliency and accessibility to air. All wool is the next best choice. Flock tends to become lumpy. The spring mattress is the most expensive and luxurious type, and is also to be recommended from the hygienic point of view, as sagging is practically impossible.

Rubber mattresses are now available, made of sponge rubber built up in tiers with spaces for ventilation.

They are resilient and hygienic, and as they resist the attack of insects, are particularly useful in the tropics. They are 4-6 in thick, with a top and bottom layer of hair.

The bedstead itself should either be a divan or have a plain wood headboard and low foot-end, the natural grain of the wood supplying the decoration. New types are made of chromium plate and have side units consisting of bookcase and shelves in various formations. Divans can be made to serve various purposes. Some have a removable headboard, one kind being fitted with folding legs, so that it may be used as a table during the day. Settee and chair-beds are made in many designs, and are useful for the occasional visitor in the small house, as well as for the bed-sitting room.

The tiny infant cannot be better accommodated than in a basket cot with stand, which can be used both indoors and in the garden, and in the early months a mattress of



Bed with Divan Headboard

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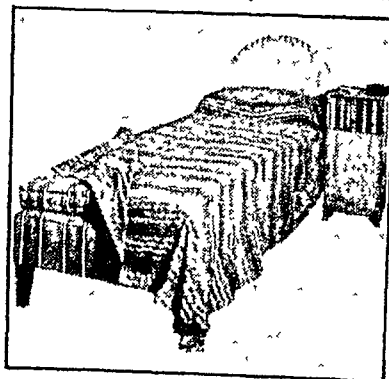


## Beds

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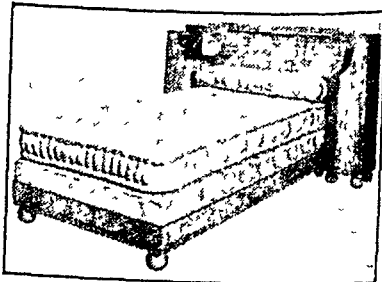
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